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Report No.: TMWK2212005128KS

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# RF Exposure Evaluation Report

**FCC 47 CFR § 2.1091**

for

**Enkore Smart Semi-Auto Electronic Deadbolt**

**Model Name.: EKS-D7P1S, EKS-D791S**

Prepared for:

**Pamex Inc.**

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Prepared by

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**Issue Date: February 4, 2023**

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## Revision History

| Rev. | Issue Date       | Revisions                        | Effect Page | Revised By |
|------|------------------|----------------------------------|-------------|------------|
| 00   | January 19, 2023 | Initial Issue                    | ALL         | Doris Chu  |
| 01   | February 4, 2023 | See the following Note Rev. (01) | P.7, P.12   | Doris Chu  |

Rev. (01)

1. Modify NFC Result Power 3m to 30m in section 3.2.
2. Modify NFC test result in section 5.



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## 1 Attestation of Test Results

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Applicant Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Pamex Inc.                                                                                                                  |
| Model Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | EKS-D7P1S;EKS-D791S                                                                                                         |
| Applicable Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | FCC 47 CFR § 2.1091<br>KDB 447498 D04<br>FCC 47 CFR § 1.1307<br>FCC 47 CFR § 1.1310<br>Published RF exposure KDB procedures |
| Receive EUT Date:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | December 9, 2022                                                                                                            |
| <p>Compliance Certification Services Inc. , tested the above equipment in accordance with the requirements set forth in the above standards. Determination of compliance is based on the results of the compliance measurement,not taking into account measurement instrumentation uncertainty.All indications of Pass/Fail in this report are opinions expressed by Compliance Certification Services Inc, based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.</p> |                                                                                                                             |
| <p>Approved &amp; Released By:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                             |
| <p>Sky Zhou<br/>Asst. Section Manager<br/>Compliance Certification Services Inc.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                             |



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## 2 Test Specification, Methods and Procedures

The tests documented in this report were performed in accordance with FCC 47 CFR § 2.1091, the following FCC Published RF exposure [KDB](#) procedures:

- 447498 D04 Interim General RF Exposure Guidance v01
- 865664 D02 RF Exposure Reporting v01r02



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### 3 Device Under Test (DUT) Information

#### 3.1 DUT Description

|                   |                                                       |
|-------------------|-------------------------------------------------------|
| Product           | Enkore Smart Semi-Auto Electronic Deadbolt            |
| Trade Name        | Pamex                                                 |
| Model No.         | EKS-D7P1S, EKS-D791S                                  |
| Model Discrepancy | EKS-D7P1S: Nickel Plating<br>EKS-D791S: Black Plating |
| Hardware Version  | V0.0.6                                                |
| Software Version  | NFC & WIFI: 000007<br>BT: 000011_00.03.01_00.01.01    |
| Sample Stage      | Identical prototype                                   |

### 3.2 Wireless Technologies

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--|-----|----------|-----------|--------|--|--|--------------------|-----------|------------|--------------------|-----------|------------|--------------------------|-----------|------------|--------------------------|-----------|------------|
| Frequency bands          | <input checked="" type="checkbox"/> Bluetooth: 2402MHz-2480MHz<br><input checked="" type="checkbox"/> 802.11b/g/n HT20: 2412MHz ~ 2462 MHz<br><input checked="" type="checkbox"/> 802.11n HT40: 2422MHz ~ 2452 MHz<br><input checked="" type="checkbox"/> NFC: 13.56 Mhz<br><input type="checkbox"/> Others                                                                                                                       |            |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
| Exposure classification  | <input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm2)<br><input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm2)                                                                                                                                                                                                                                                               |            |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
| Antenna Specification    | WIFI 2.4GHz:<br>Chip Antenna<br>Gain: 2.17 dBi<br><br>BLE:<br>PCB Antenna<br>Gain: 3.3 dBi<br><br>NFC:<br>Loop PCB Antenna<br><br>2.4GHz:    Gain :        2.17 dBi    (Numeric gain: 1.65)        Worst<br>BLE        Gain :        3.30 dBi    (Numeric gain: 2.14)        Worst                                                                                                                                                |            |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
| Maximum tune up power    | <table><tr><td>BLE</td><td>1.50 dBm</td><td>(1.41 mW)</td></tr><tr><td>2.4GHz</td><td></td><td></td></tr><tr><td>IEEE 802.11b Mode:</td><td>11.50 dBm</td><td>(14.13 mW)</td></tr><tr><td>IEEE 802.11g Mode:</td><td>16.00 dBm</td><td>(39.81 mW)</td></tr><tr><td>IEEE 802.11n HT 20 Mode:</td><td>15.00 dBm</td><td>(31.62 mW)</td></tr><tr><td>IEEE 802.11n HT 40 Mode:</td><td>17.00 dBm</td><td>(50.12 mW)</td></tr></table> |            |  | BLE | 1.50 dBm | (1.41 mW) | 2.4GHz |  |  | IEEE 802.11b Mode: | 11.50 dBm | (14.13 mW) | IEEE 802.11g Mode: | 16.00 dBm | (39.81 mW) | IEEE 802.11n HT 20 Mode: | 15.00 dBm | (31.62 mW) | IEEE 802.11n HT 40 Mode: | 17.00 dBm | (50.12 mW) |
| BLE                      | 1.50 dBm                                                                                                                                                                                                                                                                                                                                                                                                                          | (1.41 mW)  |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
| 2.4GHz                   |                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
| IEEE 802.11b Mode:       | 11.50 dBm                                                                                                                                                                                                                                                                                                                                                                                                                         | (14.13 mW) |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
| IEEE 802.11g Mode:       | 16.00 dBm                                                                                                                                                                                                                                                                                                                                                                                                                         | (39.81 mW) |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
| IEEE 802.11n HT 20 Mode: | 15.00 dBm                                                                                                                                                                                                                                                                                                                                                                                                                         | (31.62 mW) |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
| IEEE 802.11n HT 40 Mode: | 17.00 dBm                                                                                                                                                                                                                                                                                                                                                                                                                         | (50.12 mW) |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |
| NFC Result Power         | 13.56MHz        21.07 dBuV/m (30m)                                                                                                                                                                                                                                                                                                                                                                                                |            |  |     |          |           |        |  |  |                    |           |            |                    |           |            |                          |           |            |                          |           |            |

#### Notes:

- For more details, please refer to the User's manual of the EUT.
- Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
- Disclaimer The variant model numbers / trademarks are assessed as identical in hardware and software to each other, hence all variants are fully covered by the test results in this test report without further verification test.
- The tune up power referred the AVG power of the test report TMWK2212005122KR, TMWK2212005126KR and TMWK2212005127KR for RF Exposure assessment purpose.

## 4 Maximum Permissible Exposure

### 4.1 Limits for Maximum Permissible Exposure (MPE)

**Table 1 - Limits for Maximum Permissible Exposure (MPE)**

| Frequency range (MHz)                                   | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | 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 <sup>2</sup>                | 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 <sup>2</sup>                | 30                       |
| 30-300                                                  | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300-1,500                                               |                               |                               | f/1500                              | 30                       |
| <b><u>1,500-100,000</u></b>                             |                               |                               | 1.0                                 | 30                       |

## 4.2 MPE Calculation Method

### Calculation

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{377}$

Where E = Field strength in Volts / meter

P = Power in Watts

G = Numeric antenna gain

d = Distance in meters

S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \text{ Equation 1}$$

Where d = Distance in cm

P = Power in mW

G = Numeric antenna gain

S = Power density in mW / cm<sup>2</sup>

If, Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

### 4.3 MPE EXEMPTION

- (A) The available maximum time-averaged power is no more than 1 mW
- (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. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).  $P_{th}$  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);

- (C) Using Table 1 and 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. For the exemption in Table 1 to apply,  $R$  must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of  $\lambda/4$  or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

| 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                                                     | $0.0128 R^2 f$ .      |
| 1,500-100,000                                                 | $19.2 R^2$ .          |
| Note: $R$ is in meters, $f$ is in MHz.                        |                       |

#### 4.4 Multiple RF sources

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),

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

## 5 Radio Frequency Radiation Max Exposure Evaluation

Substituting the MPE safe distance using  $d = 20$  cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where  $P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>

### Bluetooth

| Mode | Frequency (MHz) | Max Tune-up power(dBm) | Max Tune-up power(mW) | G(dBi) | G(num.) | D(cm) | Power Density in mW/cm2 | Power Density in mW/cm2 |
|------|-----------------|------------------------|-----------------------|--------|---------|-------|-------------------------|-------------------------|
| BLE  | 2480.00         | 1.50                   | 1.41                  | 3.30   | 2.14    | 20.0  | 0.001                   | 1.000                   |

### WIFI 2.4GHz

| Mode               | Frequency (MHz) | Max Tune-up power(dBm) | Max Tune-up power(mW) | G(dBi) | G(num.) | D(cm) | Power Density in mW/cm2 | Power Density in mW/cm2 |
|--------------------|-----------------|------------------------|-----------------------|--------|---------|-------|-------------------------|-------------------------|
| IEEE 802.11b       | 2462.00         | 11.50                  | 14.13                 | 2.17   | 1.65    | 20.0  | 0.005                   | 1.000                   |
| IEEE 802.11g       | 2462.00         | 16.00                  | 39.81                 | 2.17   | 1.65    | 20.0  | 0.013                   | 1.000                   |
| IEEE 802.11n HT 20 | 2462.00         | 15.00                  | 31.62                 | 2.17   | 1.65    | 20.0  | 0.010                   | 1.000                   |
| IEEE 802.11n HT 40 | 2452.00         | 17.00                  | 50.12                 | 2.17   | 1.65    | 20.0  | 0.016                   | 1.000                   |

### NFC

| Mode | Frequency (MHz) | Result power (dBuV/m) | Electric Field Strength (V/m) | Limit of Electric Field Strength (V/m) |
|------|-----------------|-----------------------|-------------------------------|----------------------------------------|
| NFC  | 13.56           | 21.07                 | 0.00                          | 60.77                                  |

### 6 Simultaneous Transmission Analysis

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),

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

#### Simultaneous Transmission Condition

| RF Exposure Condition | Item | Capable Transmit Configurations |   |     |       |
|-----------------------|------|---------------------------------|---|-----|-------|
|                       | 1    | DTS                             | + | BLE | + NFC |

#### 6.1 Sum of the WIFI 2.4GHZ & Bluetooth & NFC

Therefore, the worst-case situation is 0.016 / 1 + 0.001 / 1 + 0 / 60.77 = 0.017, which is less than “1”.



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## 7 Facilities

All measurement facilities used to collect the measurement data are located at

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

☐ No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan.

**END OF REPORT**