



Project No.: TM-2212000124P
Report No.: TMWK2212005128KS

FCC ID: 2AQ8A-EKSD7X1S

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Rev.: 01

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.

4680 Vinita Court, Chino, CA, 91710, United States

Prepared by

Compliance Certification Services Inc.

Wugu Laboratory

No.11, Wugong 6th Rd., Wugu Dist.,

New Taipei City, Taiwan.

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 KDB 447498 D04 FCC 47 CFR § 1.1307 FCC 47 CFR § 1.1310 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 & Released By:</p> 	
<p>Sky Zhou Asst. Section Manager Compliance Certification Services Inc.</p>	

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 EKS-D791S: Black Plating
Hardware Version	V0.0.6
Software Version	NFC & WIFI: 000007 BT: 000011_00.03.01_00.01.01
Sample Stage	Identical prototype

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3.2 Wireless Technologies

Frequency bands	<input checked="" type="checkbox"/> Bluetooth: 2402MHz-2480MHz <input checked="" type="checkbox"/> 802.11b/g/n HT20: 2412MHz ~ 2462 MHz <input checked="" type="checkbox"/> 802.11n HT40: 2422MHz ~ 2452 MHz <input checked="" type="checkbox"/> NFC: 13.56 Mhz <input type="checkbox"/> Others																				
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)																				
Antenna Specification	<p>WIFI 2.4GHz: Chip Antenna Gain: 2.17 dBi</p> <p>BLE: PCB Antenna Gain: 3.3 dBi</p> <p>NFC: Loop PCB Antenna</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">2.4GHz:</td> <td style="width: 10%;">Gain :</td> <td style="width: 20%;">2.17 dBi</td> <td style="width: 20%;">(Numeric gain: 1.65)</td> <td style="width: 20%;">Worst</td> </tr> <tr> <td>BLE</td> <td>Gain :</td> <td>3.30 dBi</td> <td>(Numeric gain: 2.14)</td> <td>Worst</td> </tr> </table>			2.4GHz:	Gain :	2.17 dBi	(Numeric gain: 1.65)	Worst	BLE	Gain :	3.30 dBi	(Numeric gain: 2.14)	Worst								
2.4GHz:	Gain :	2.17 dBi	(Numeric gain: 1.65)	Worst																	
BLE	Gain :	3.30 dBi	(Numeric gain: 2.14)	Worst																	
Maximum tune up power	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">BLE</td> <td style="width: 20%;">1.50 dBm</td> <td style="width: 40%;">(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)
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IEEE 802.11n HT 40 Mode:	17.00 dBm	(50.12 mW)																			
NFC Result Power	13.56MHz 21.07 dBuV/m (30m)																				

Notes:

1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
3. 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.
4. The tune up power referred the AVG power of the test report TMWK2212005122KR, TMWK2212005126KR and TMWK2212005127KR for RF Exposure assessment purpose.

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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 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

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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 / cm²

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 λ 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	19.2R 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),

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

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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 / cm²

Bluetooth

Mode	Frequency (MHz)	Max Tune-up power(dBm)	Max Tune-up power(mW)	G(dBi)	G(num.)	D(cm)	Power Density in mW/cm ²	Power Density in mW/cm ²
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/cm ²	Power Density in mW/cm ²
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

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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	+

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