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C.I.F. A29 507 456

Test report No:
NIE: 71590RAN.002

Assessment report
RF EXPOSURE REPORT ACCORDING TO
FCC 47 CFR Part 2.1091; FCC 47 CFR Part 1.1307
FCC 47 CFR Part 1.1310

(*) Identification of item under evaluation	Proximity electromechanic lock
(*) Trademark	Ojmar
(*) Model and /or type reference	OTS Pulse
(*) Other identification of the product	HW version: OTS Pulse 1.0.2 SW Version: 2.0.0 FCC ID: 2ANY7OJM007
(*) Features	Technologies: Mifare Classic, Mifare Desfire EV1/EV2 2K, 4K and 8K, MIfare Ultralight, HID iClass and HID Seos. Compatible with Ultralight C and technogym. BLE. Wireless protocol: Propietary protocol based on 802.15.4 Power supply: 4x1,5V AA Alkaline batteries Functional temperature range: -10º to 42º (without condensation) Autonomy: Up to 8 years (Depending on usage, humidity and temperature) Approximate weight: 375 g
(*) Manufacturer	OJMAR S.A Polígono industrial de lerun s/n 20870 / Elgoibar / Gipuzkoa
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. FCC 47 CFR Part 1.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared. FCC 47 CFR Part 1.1310: Radiofrequency radiation exposure limits.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Manuel García Antennas Laboratory Technical Responsible 74862741H MANUEL GARCÍA (C:A29507456) 74862741H MANUEL GARCÍA (C:A29507456) 2024.08.05 12:24:24 +02'00'
Date of issue	2024-08-05

Report template No	FAN36_02 (*) “Data provided by the client”

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Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item under evaluation", "Trademark", "Model and/or type reference", “General description of the device”, “Other identification of the product”).
2. Maximum antenna gain and use distance information.
3. The device under evaluation consists of a Proximity electromechanic lock that communicates via RFID (13,56MHz) using Mifare Classic, Mifare Desfire and Mifare Ultralight technologies. Lock is powered by 4 AA batteries of 1,5V each one. Lock also allows NFC communication at 13,56MHz for maintenance purposes.Working mode is following one:

   Once knob is pressed, a switch is activated that starts communication between interior antenna and proximity card. Lock reads the UID of the card or the UID of the smartphone that is sent by BLE and send the information to the Gateway. Gateway, with the information that has stored in its memory, answers back accepting or denying the petition operation. Once received, lock moves the motor and closes. After that, lock sends the event of operation to Gateway. Opening is made in the same way.

   Lock is sleep until the switch is pressed.

DEKRA Testing and Certification, S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Identification of the client

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Document history

Report number	Date	Description
71590RAN.002	2024-08-05	First release

Appendix A: FCC RF Exposure assessment result

General description of the device under evaluation

Table 1 shows information used for the RF Evaluation, taking into account the following declared specifications for the device:

Description and technologies: the device under evaluation consists of a Proximity electromechanic lock that communicates via RFID (13,56MHz) using Mifare Classic, Mifare Desfire and Mifare Ultralight technologies. Lock is powered by 4 AA batteries of 1,5V each one. Lock also allows NFC communication at 13,56MHz for maintenance purposes.Working mode is following one:

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Lock is sleep until the switch is pressed with the following features: BTLE, Proximity and RFID that will be taken into account for RF Exposure evaluation.

Evaluation Distance: according to the manufacturer, during its normal use, the separation distance between the radiating structures of the device and nearby users will be greater than 20 cm. In order to perform the assessment a conservative evaluation distance of 20 cm has been used.

Maximum output power:

- Values corresponding to Proximity maximum output power have been stated in module manufacturer´s datasheet.
- Values corresponding to BTLE conducted output power have been measured and stated into DEKRA Testing and Certification, S.A.U. test report num. 71590RAN.004.
- Values corresponding to RFID maximum E-Field power have been measured and stated into DEKRA Testing and Certification, S.A.U. test report num. 71590RAN.003.

Antenna under evaluation: values corresponding to maximum peak antenna gain have been declared and stated in antenna manufacturer´s datasheet.

The following table shows the information provided above:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Maximum Conducted Output Power (dBm)	Antenna peak gain (dBi)	Measured E-Field at 3m (dBµV/m)	Maximum E.R.P. (dBm)	Maximum E.R.P. (mW)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
BTLE	2.4 GHz	2400 - 2483.5	-9.20	1.50	-	-9.85	0.10	-7.70	0.17
Proprietary	2.4 GHz	2402 - 2480	8.00	1.50	-	7.35	5.43	9.50	8.91
RFID	13.56	13.56	-	-	14.58	-	-	-	-

Table 1: Equipment specifications

Evaluation Results

RF Exposure Exemption evaluation:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Distance (cm)	Maximum Conducted Power (mW)	Maximum E.R.P. (mW)	§1.1307(b)(3).i.(C) Exposure Limit (mW)	Verdict for exemption § 1.1307(b)(3).i
BTLE	2.4 GHz	2400 - 2483.5	20.00	N/A	0.10	768.00	**Pass**
Proprietary	2.4 GHz	2402 - 2480	20.00	N/A	5.43	768.00	**Pass**
RFID	13.56	13.56	20.00	-	N/A	N/A	**MPE required**

Table 2: FCC Exemption Evaluation Results

The device fails to comply with applicable §1.1307(b)(3).i. exemption limits, so Maximum Permissible Exposure (MPE) evaluation is necessary to demonstrate compliance.

RF Exposure MPE evaluation:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Distance (cm)	Power density (mW/cm²)	FCC General Population Limit (mW/cm²)	Verdict
BTLE	2.4 GHz	2400 - 2483.5	20.00	0.00003	1.00	**Pass**
Proprietary	2.4 GHz	2402 - 2480	20.00	0.002	1.00	**Pass**
RFID	13.56	13.56	20.00	0.0000000004	0.98	**Pass**

Table 3: FCC Evaluation Results

The computed value(s) are below the limit(s), so these modes meet the requirements stated in FCC 47 CFR Part 1.1310.

Appendix B: FCC RF Exposure information

RF Exposure determination of exemption

According to FCC 47 CFR §1.1307 (b)(3) Determination of exemption:

(i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2), a single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (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). Pth is given by:

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

Where

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

and

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

d = the separation distance (cm);

(C) Or 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 λ/2π, 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 λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

TABLE 1 TO §1.1307(b)(3)(i)(C)—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.

(ii) For multiple RF sources: Multiple RF sources are exempt if:

(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). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

(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.

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

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for Pth, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

Pi = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

Pth,i = the exemption threshold power (Pth) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

ERPj = the ERP of fixed, mobile, or portable RF source j.

ERPth,j = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

Evaluated,k = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit,k = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from §1.1310 of this chapter.

The available maximum time-averaged power or effective radiated power (ERP), can be calculated using the following formula to assess compliance with the Exemption Limits:

$P_{E.I.R.P.} = P_T + G_T - L_C$

Where:

P_T= transmitter time-averaged output power (including Duty Cycle and tune-up tolerance, if applicable)

G_T= gain of the transmitting antenna

L_C = signal attenuation in the connecting cable between the transmitter and the antenna if applicable

$P_{E.R.P.} = P_{E.I.R.P.} – 2.15$ dB

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RF Exposure evaluation

Limits for Maximum Permissible Exposure (MPE) for RF sources are defined in FCC 47 CFR "§1.1310 Radiation Exposure limits, paragraph (e)":

TABLE 1 TO §1.1310(E)(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)
(i) 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
(ii) 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

f = frequency in MHz. * = Plane-wave equivalent power density.

Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst-case" or conservative prediction:

Power density: $S[mW/cm^2] = \frac{P_{E.I.R.P.}[mW]}{4\Pi R[cm]^2}$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

$P_{E.I.R.P.}$ = $P_T + G_T - L_C$

Where:
P_T= transmitter time-averaged output power (including Duty Cycle and tune-up tolerance, if applicable)
G_T= gain of the transmitting antenna
L_C = signal attenuation in the connecting cable between the transmitter and the antenna if applicable

RFID output power calculation

Output power values corresponding to RFID technology shown in Table 1 of “General description of the device under evaluation” section are calculated from maximum measured field strength values stated into DEKRA Testing and Certification test report num. 71590RAN.003 (see table below) following the calculation described below:

Operation Mode	Frequency (MHz)	Maximum E-field strength (dBµV/m) measured at 3 m
RFID	13.561	14.58

According to ANSI C63.10-2020/Cor 1-2023, section 6.4.4.2:

If the Maximum E-field strength measured is at a distance greater than λ/2π, then extrapolation to the limit distance shall be calculated using the following equation:

$$FS_{\text{limit}} = FS_{\text{max}} - 20\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

If both the Maximum E-field strength measured and the limit distance are equal to or closer to the EUT than λ/2π the extrapolation to the limit distance shall be calculated using the following equation:

$$FS_{\text{limit}} = FS_{\text{max}} - 40\log\left(\frac{d_{\text{limit}}}{d_{\text{measure}}}\right)$$

Where:

FS_{limit}	is the calculation of field strength at the limit distance, expressed in dBµV/m
FS_{max}	is the measured field strength, expressed in dBµV/m
$d_{measured}$	is the distance of the measurement point from the EUT
d_{limit}	is the reference distance or the distance of the λ/2π point.

As a result of this calculation, equivalent output power (dBµV/m) at minimum distance of use between user and device is obtained, which is converted to Power Density units as follows:

$$PD\ (W/m^2) = FS_{limit}\ (V/m)^2 / 377$$