

File Number **23/36404072****TECHNICAL REPORT****Human exposure****Petitioner's Reference:** Lock Up Smart Doors S.L.

Company Address: Calle Escritor Jeronimo Tristante, N10, 3B, Murcia, 30100, SPAIN

Represented by: Juan Jesus Pinuaga Cascales

Equipment: Boost Plus

Brand: Operto PMN: PUO-001

Sample #1: N/A Applus Id: 17170-00003

Result: **complies**

It has been tested and complies with the applicable standard. See test result summary section.

Applicable Standard:EMC standard/s: **FCC 47 CFR Part 2 Subpart J Section 2.1093 (October 2021)¹**
KDB 447498 D01 - General RF Exposure Guidance¹The latest modifications of the standard, published at the date of the tests reported in this document, have been considered.**Dates and Test Site:** Applus Barcelona, Bellaterra

Equipment Reception Date: July 11, 2023

Test Initial Date: November 2, 2023

Test Final Date: November 17, 2023

Test Manager: Alejandro Sáez**Date of issue:** Bellaterra, November 17, 2023EMC & Wireless Technical Manager
Electrical and Electronics
LGAI Technological Center S.A.

The results refer only and exclusively to the sample, product or material delivered for testing, and tested under conditions stipulated in this document. The equipment has been tested under conditions stipulated by standard(s) quoted in this document.

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2 GENERAL DESCRIPTION OF TEST ITEMS

2.1 EQUIPMENT DESCRIPTION

This information has been provided by the customer and it is not covered by the accreditation. LGAI does not assume any responsibility from it

EQUIPMENT DESCRIPTION				
Description	Wireless module to add BLE capabilities to hotel locks			
EUT Version	FVIN		HVIN	
	7.5.2		V2	
Power supply	DC	+/-	4 – 11 V	-- Hz
Modulation	GFSK			
Equipment Type	DTS			

Table 1: Equipment description

RF FEATURES	
Radio chipset	CC2640
Brand	Texas Instruments
Module model	N/A (Not a module, radio is part of the rest of the system)
Peak gain antenna	+3.3 dBi
FCC ID	2BB7M-PUO-001
ISED ID	30937-PUO001

Table 2: RF Features

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2.2 TEST CONFIGURATION

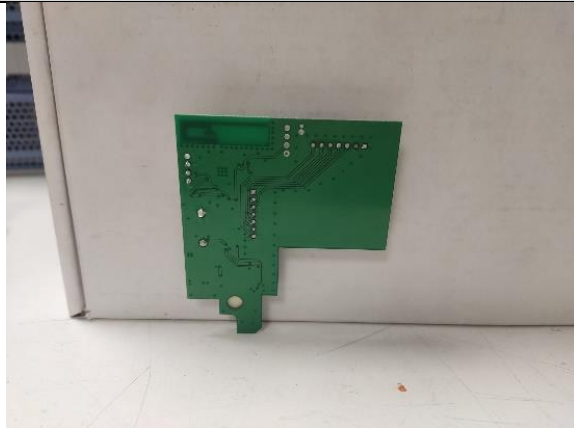
TEST CONFIGURATION			
Power Supply	Power by 4 x batteries AA 1.5V. Total power 6V		
Set-up	Description	Orientation	
	The EUT horizontally, as it is intended to be placed in normal operation.	 Fig. 1: EUT Orientation	
Normal test temperatures	15 °C to 35 °C		
Equipment Type	DTS		
Test exercise	For measurements tests the EUT is configured at maximum RF output power with continuous modulated transmission, DC > 98% constant according to the customer.		
Test Modes	Channel	Frequency [MHz]	Bandwidth [MHz]
	37	2402	2
	17	2440	2
	39	2480	2

Table 3. Test Configuration

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2.2.1 Samples

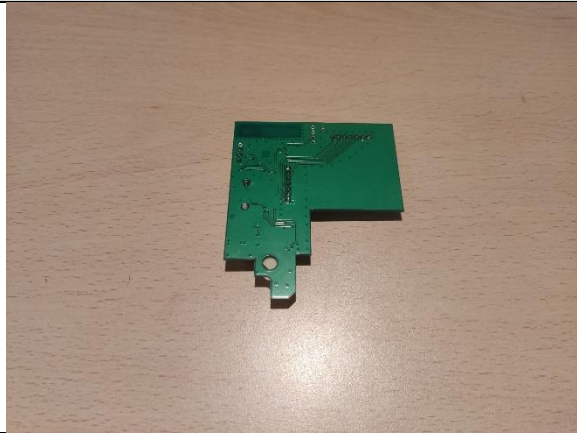
Sample #1	
	
Front View	Rear View
	Applus⁺ laboratories ID Submuestra: 17170-00003  Cliente: SHERPA CERTIFICATION S.L Código Oferta: DV-2302204K00-3 Fecha Recepción: 11-07-2023 Marca Muestra: Sherpa Modelo: Boost Plus Nº de Serie:
Id Label	Applus ID Label

Table 4: Sample #1 description

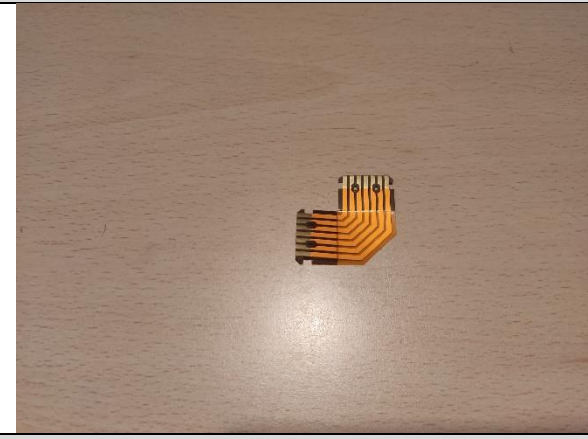
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2.2.2 Auxiliary Equipment

Auxiliary Equipment	
	
Battery Holder	Production cables
	
Serial Cable	USB to Serial Converter
	--
Production cables	--

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Description	Port #	Name	Type	Comments
	0	Battery Holder	Power Supply	Provided by customer
	1	Production cables	Communication	Provided by customer
	2	Serial cable	Communication	Provided by customer
	3	USB to Serial Converter	Communication	Provided by customer
	4	Production cables	Communication	Provided by customer
	5	HCI Tester Version 3.0.0.37	Software	Provided by Applus

Table 5: Auxiliary equipment #1 description

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2.2.3 DUT Modifications performed

No modifications have been performed.

2.3 DUT TEST MODES

DUT Operation Modes		
Mode #	Description	Set-up
1	- The EUT is configured as indicated in the document "Certification Lab Test Guide" provided by the costumer. - The software used to send commands to the devices are provided by Texas Instruments (TI), the manufacturer of the IC used for radio communication. - The app is called HCITester, used to send any HCI command available for the device. - The application is used to configure the channel and power of the EUT before performing the test by means of the following commands: <u>HCI_EXT_SetTxPowerCmd:</u> <u>HCI_EXT_ModemTestTxCmd</u> - The EUT is configured at maximum RF output power, +5 dBm.	Table top

Table 6: DUT Operation Modes

2.4 CONTROL AND MONITORING

During the tests, a receiver is used to check that the operating frequency is in accordance with the frequency configured in the software.

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3 TEST RESULTS

3.1 HUMAN EXPOSURES STANDARDS

3.1.1 Test Parameters

According to the standard FCC 47 CFR Part 2 Subpart J KDB 447498 D01.

3.1.1.1 Requirements

For operations within the frequency range of 300 kHz and 6 GHz (inclusive), the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 in paragraph (e)(1) of this section, may be used instead of whole-body SAR limits as set forth in paragraphs (a) through (c) of this section to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b) of this part, except for portable devices as defined in § 2.1093 of this chapter as these evaluations shall be performed according to the SAR provisions in § 2.1093.

Frequency Range [MHz]	Electric field strength [V/m]	Magnetic field strength [A/m]	Power density [mW/cm ²]	Averaging time [minutes]
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 - 100000	-	-	5	<6
Limits for Occupational / Controlled 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 - 1500	-	-	f/1500	<30
1500 - 100000	-	-	1.0	<30

Table 7: Requirements – Human Exposure Standards

f=frequency

*=Plane-wave equivalent power density

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3.1.2 Test Results

For the evaluation of the RF exposure, the maximum conducted output power is obtained from the following test reports: 23/36404070

Channel	Central Frequency [MHz]	Peak Power [dBm]	Antenna Gain [dBi]	E.I.R.P [dBm]
37	2402	-3.1	+3.3	0.2
17	2440	-3.9	+3.3	-0.6
39	2480	-4.5	+3.3	-1.2

Table 8: Maximum Conducted Output Power – Human Exposure Standards

Therefore, through the following equation, is computed the power density at each frequency transmitted band for a minimum distance of 20 cm between the DUT and the person to comply with the power density limit.

$$S = \frac{EIRP}{4 * \pi * d^2}$$

Where:

S = Power density (mW/cm²)

EIRP = Radiated output power of an isotropic antenna (mW)

d = Distance to the center of radiation of the antenna (cm). Limit for MPE = 20 cm.

According to Radiofrequency radiation exposure limits of FCC Part 1 Section §1.1310 paragraph (e), the maximum permissible exposure (MPE) for 1500 MHz - 100000 MHz, which the DUT is operating is:

Channel	Central Frequency [MHz]	Power Density at 20 cm [mW/cm ²]	Power Density Limits [mW/cm ²]	Result
37	2402	0.0002	1	PASS
17	2440	0.0002	1	PASS
39	2480	0.0002	1	PASS

Table 9: Results – Human Exposure Standards

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