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C.I.F. A29 507 456

Test report No:
NIE: 59220RAN.002

Assessment report
RF EXPOSURE REPORT ACCORDING TO
FCC 47 CFR Part 2.1091
ISED RSS-102 Issue 5:2015

(*) Identification of item under evaluation	USB/Ethernet RFID encoder
(*) Trademark	SALTO NCoder, NCoder Fingerprint
(*) Model and /or type reference	EC0B, EC0J, EC0BF, EC0JF (type reference: A1928)
Other identification of the product	Hardware version: 1.0 Software version: 0164 (Control Firmware) + 0172 / 0173 (Reader Firmware for EC0B and EC0BF / EC0J and EC0JF) + 0136 (BGM111 Firmware)
(*) Features	USB, Ethernet and a certified Bluetooth module (BGM111)
Manufacturer	SALTO Systems, S.L. Arkotz 9, Polígono Lanbarren 20180, Oiartzun, Gipuzkoa, SPAIN
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) IEEE Std C95.3™ -2002 (R2008). IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz–300 GHz
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager  MIGUEL LACAVE GARCÍA 2019.11.27 11:16:36 +01'00'
Date of issue	2019-11-27
Report template No	FAN36_01 (*) "Data provided by the client"

Index

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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 tested", "Trademark", "Model and/or type reference tested").
2. Maximum output power and maximum antenna gain information.
3. EC0B model consists of a SALTO NCoder with USB/Ethernet RFID Mifare (ISO14443A & ISO15693 standard based) and Bluetooth Smart (BGM111 module) technology.

   EC0BF model consists of a SNCoder Fingerprint, with USB/Ethernet RFID Mifare (ISO14443A & ISO15693 standard based) and Bluetooth Smart (BGM111 module) technology and a Fingerprint reader.

   EC0J model consists of a SALTO NCoder with USB/Ethernet RFID HID iCLASS (ISO14443A & ISO15693 standard based) and Bluetooth Smart (BGM111 module) technology.

   EC0JF model consists of a SNCoder Fingerprint with USB/Ethernet RFID HID iCLASS (ISO14443A & ISO15693 standard based) and Bluetooth Smart (BGM111 module) technology and a Fingerprint reader.

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Identification of the client

SALTO Systems, S.L.

Arkotz 9, Polígono Lanbarren

20180, Oiartzun, Gipuzkoa, SPAIN

Document history

Report number	Date	Description
59220RAN.002	2019-11-27	First release

General description of the device under evaluation

EC0B and EC0BF models support RFID Mifare (ISO14443A & ISO15693 standard based) and Bluetooth (BGM111 module) technologies.

EC0B and EC0BF models support RFID HID iCLASS (ISO14443A & ISO15693 standard based) and Bluetooth (BGM111 module) technologies.

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

The equipment specifications declared by the manufacturer for each supported technology and band are:

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Antenna peak gain (dBi)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
Bluetooth	2.4 GHz	2400 - 2483.5	8.00	1.00	9.00	7.94
RFID Mifare / HID iCLASS	13.56 MHz	13.553 - 13.567	23.00	N/A	23.00	199.53

Table 1: Equipment specifications

RF Exposure Assessment result and verdict

FCC assessment:

Limits for Maximum Permissible Exposure (MPE) to comply with FCC 47 CFR § 2.1091 are defined in "§1.1310 Radiation Exposure limits, paragraph (e)":

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	Power density (mW/cm^2)	FCC General Population Limit (mW/cm^2)	Verdict
Bluetooth	2.4 GHz	2400 - 2483.5	20.00	0.00	1.00	**Pass**
RFID Mifare / HID iCLASS	13.56 MHz	13.553 - 13.567	20.00	0.04	0.98	**Pass**

Table 2: Assessment result and verdict

Simultaneous Transmission assessment:

Simultaneous technologies and modes	Result	Limit	Verdict
Bluetooth + RFID Mifare / HID iCLASS	0.04	1	**Pass**

Table 3: Simultaneous Transmission assessment

ISED assessment:

Limits for RF Field Strength to comply with RSS-102 Issue 5 are defined in "Health Canada's RF exposure guideline, Safety code 6":

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	Power density (W/m^2)	ISED General Public Limit (W/m^2)	Verdict
Bluetooth	2.4 GHz	2400 - 2483.5	20.00	0.02	5.35	**Pass**
RFID Mifare / HID iCLASS	13.56 MHz	13.553 - 13.567	20.00	0.40	2.00	**Pass**

Table 4: Assessment result and verdict

Simultaneous Transmission assessment:

Simultaneous technologies and modes	Result	Limit	Verdict
Bluetooth + RFID Mifare / HID iCLASS	0.20	1	**Pass**

Table 5: Simultaneous Transmission assessment

Appendix A: FCC RF Exposure information

FCC RF Exposure evaluation

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	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/f²	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/f²	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

FCC MPE Evaluation

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

Minimum compliance distance: $$R_{\min}[cm] = \sqrt{\frac{P_{E.I.R.P.}[mW]}{4\Pi S[mW/cm^2]}}$$

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)

$R_{\min}$ = distance to the center of radiation of the antenna

Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i} < 1$$

Where

S_i is the power flux density of each source;

MPE_i is the power flux density basic restriction of each source.

Appendix B: ISED RF Exposure information

ISED RF Exposure evaluation for mobile devices

According to RSS-102 Issue 5, Paragraph "4. Exposure Limits", Industry of Canada has adopted the RF field strength limits established in Health Canada's RF exposure guideline, Safety code 6:

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

Table 6: RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[23]	170	180	-	Instantaneous*
0.1-10	-	$1.6/f$	-	6**
1.29-10	$193/f^{0.5}$	-	-	6**
10-20	61.4	0.163	10	6
20-48	$129.8/f^{0.25}$	$0.3444/f^{0.25}$	$44.72/f^{0.5}$	6
48-100	49.33	0.1309	6.455	6
100-6000	$15.60 f^{0.25}$	$0.04138 f^{0.25}$	$0.6455 f^{0.5}$	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	$616000/f^{1.2}$
150000-300000	$0.354 f^{0.5}$	$9.40 \times 10^{-4} f^{0.5}$	$3.33 \times 10^{-4} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

ISED MPE Evaluation

Each supported transmission technology will be evaluated to determine if it is in compliance with RSS-102 Issue 5, RF Field Strength Limits for devices used by the General Public.

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: $S[W/m^2] = \frac{P_{E.I.R.P.}[W]}{4\Pi R[m]^2}$

Minimum compliance distance: $R_{\min}[m] = \sqrt{\frac{P_{E.I.R.P.}[W]}{4\Pi S[W/m^2]}}$

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)

$R_{\min}$ = distance to the center of radiation of the antenna

Multiple frequencies assessment

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure at a fixed location. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^{n} \frac{S_i}{MPE_i} < 1$$

Where

S_i is the power flux density of each source;

MPE_i is the power flux density basic restriction of each source.