Test report No:

3919ERM.007A1

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	Alarm Control Panel with integrated security and automation support
(*) Trademark	JCI/Tyco
(*) Model and /or type reference	IQ Pro
(*) Other identification of the product	FCC ID: F5322IQPRO IMEI: 86139404 Hw version: QB94Hx Rev. 0C / UA746 Rev. 01 Sw version: 4.2.0n
(*) Features	Wi-Fi 2.4GHz/5GHz, BLE, PowerG, Z-Wave, LTE
(*) Manufacturer	Tyco Safety Products Canada Ltd. 3301 Langstaff Rd., Concord, ON L4K 4L2 Canada
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)	Domingo Galvez EMC&RF Lab Manager
Date of issue	06-08-2023
Report template No	FERMUSA_200 (*) "Data provided by the client"

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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 output power, maximum antenna gain and use distance information.

3. The device under evaluation consists of the Alarm Control Panel supports wireless and wired initiating devices, communication with supervising station using cellular LTE and Ethernet communication paths. There are two configurations available: IQ Pro using metal enclosure and IQ Pro P using plastic enclosure, only differences are the use of antennas mounted outside the metal enclosure

DEKRA Certification Inc. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Identification of the client

Tyco Safety Products Canada Ltd.
3301 Langstaff Rd., Concord, ON L4K 4L2, Canada.

Document history

Report number	Date	Description
3919ERM.007	05-09-2023	First release
3919ERM.007A1	06-08-2023	Second release. Added FCC and IC ID for all modules and Updated Simultaneous transmission statement and table to show more detailed information. The modification of the test report cancels and replaces the test report no. 3919ERM.007.

Appendix A: FCC RF Exposure assessment result

General description of the device under evaluation

The device under evaluation consists of a Alarm Control Panel supports wireless and wired initiating devices, communication with supervising station using cellular LTE and Ethernet communication paths. There are two configurations available: IQ Pro using metal enclosure and IQ Pro P using plastic enclosure, only differences are the use of antennas mounted outside the metal enclosure.

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.

The values corresponding to technologies Power G, LTE, Wi-Fi 24.GHz, Wi-Fi 5GHz and BLE output power and gain have been taken from module test reports provided by manufacturer (FCC and IC ID shown in the table below).

Module	Description	FCC ID	IC ID
POWER-G Modem LP	Power G	WP3PGMODEMLP	1467C- PGMODEMLP
Quectel SC650T-NA	BTLE, LTE, Wi-Fi 2.4 GHz and Wi-Fi 5 GHz	XMR2019SC650TNA	10224A-19SC650TNA

The values corresponding to Z-wave Conducted output power has been measured and shown below.

Technology / Mode	Frequency under evaluation (MHz)	Maximum Measured Conducted Output Power (dBm)	Antenna peak gain (dBi)	Maximum Measured E.I.R.P. (dBm)
Z-wave	908-916	-0.16	1.7	1.54

The equipment specifications for each supported technology are shown in Table 1.

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Maximum Conducted Output Power (dBm)	Antenna peak gain (dBi)	Maximum E.R.P. (dBm)	Maximum E.R.P. (mW)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
LTE	14	788 - 798	25.79	4.45	28.09	644.17	30.24	1056.82
802.11b/g/n	2.4 GHz	2412 - 2484	19.00	1.25	18.10	64.57	20.25	105.93
802.11a/n/ac	5 GHz	5150 - 5850	18.44	5.05	21.34	136.14	23.49	223.36
BTLE	2.4 GHz	2400 - 2483.5	3.21	5.38	6.44	4.41	8.59	7.23
Z-wave	900 MHz	908-916	-0.16	1.70	-0.61	0.87	1.54	1.43
Power G	900 MHz	902-928	12.29	2.00	12.14	16.37	14.29	26.85

Table 1: Equipment specifications

Evaluation Results

RF Exposure Exemption evaluation:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Distance (cm)	Maximum E.R.P. (mW)	§1.1307(b)(3).i.(C) Exposure Limit (mW)	§ 1.1307(b)(3).i.(B) Exposure Limit (mW)	Verdict for exemption § 1.1307(b)(3).i
LTE	14	788 - 798	20.00	644.17	-	1627.92	Pass
802.11b/g/n	2.4 GHz	2412 - 2484	20.00	64.57	768.00	-	Pass
802.11a/n/ac	5 GHz	5150 - 5850	20.00	136.14	768.00	-	Pass
BTLE	2.4 GHz	2400 - 2483.5	20.00	4.41	768.00	-	Pass
Z-wave	Band	All	20.00	0.87	464.90	-	Pass
Power G	Band	All	20.00	16.37	461.82	-	Pass

Table 2: FCC Exemption Evaluation Results

The computed value(s) are below the exemption limit(s), so these modes meet the requirements stated in FCC 47 CFR Part 1.1307.

Simultaneous transmission assessment:

The device under evaluation is able to transmit simultaneously using LTE, Z-Wave, Power G, Bluetooth LE, Wi-Fi 2.4 GHz and Wi-Fi 5GHz transmitters, therefore the most conservative approach for the evaluation of the simultaneous transmission will be:

Simultaneous technologies and modes	Result (∑ of Pout/Pmax ratios)	Verdict (∑ ≤ 1)
LTE 14 + 802.11b/g/n 2.4 GHz + Z-wave Band + Power G Band	0.52	Pass
LTE 14 + 802.11a/n/ac 5 GHz + Z-wave Band + Power G Band	0.61	Pass
LTE 14 + BTLE 2.4 GHz + Z-wave Band + Power G Band	0.44	Pass

Table 3: Simultaneous Transmission assessment

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:

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

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 $\lambda/2\pi$, 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).

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 $R^2 f$.
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.

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

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.

P_i = 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).

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

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

$ERP_{th,j}$ = 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.

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

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotopically 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