Radio Frequency Exposure Evaluation Report

For:
Xirgo Technologies LLC

Model Number:
LX45-NA

Product Description:
IoT GNSS tracking device

FCC ID: GKM-LX45
IC: 10281A-LX45

Per:
CFR Part Part1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISED RSS-102 Issue 6

Report number: EMC_XIRGG_001_24001_FCC_ISED_RF_Exposure_EX_Rev1

DATE: 2024-11-15

***CETECOM* Inc.**
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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the below identified device with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 &1.1310), Part 2 (2.1091) and IC standard RSS-102 issue 6 under worst case conditions (measured or rated RF output power, antenna gain, distance towards human body, multiple transmitter information as presented by the applicant).
In addition, maximum antenna gain or minimum distance towards the human body is calculated respectively, where relevant.

The device meets the limits as stipulated by the above given FCC and IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

Company	Description	Model #
Xirgo Technologies LLC	IoT GNSS tracking device	LX45-NA

Responsible for the Report:

Date	Section	Name	Signature
2024-11-15	Compliance	Cheng Song (EMC Engineer)	Cheng Song CN = Cheng Song email = cheng.song@cetecom.com C = AD 2024.11.15 15:38:46 -08'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Engineer:	Cheng Song
Responsible Project Leader:	Akanksha Baskaran

2.2 Identification of the Client / Manufacturer

Client's Name:	Xirgo Technologies LLC.
Street Address:	1461 Lawrence Dr, Ste 1
City/Zip Code	Thousand Oaks, CA 91320
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Xirgo Technologies LLC.
Manufacturers Address:	1461 Lawrence Dr, Ste 1
City/Zip Code	Thousand Oaks, CA 91320
Country	USA

3 Equipment under Assessment

<table>
<tr><td>Product Description:</td><td>IoT GNSS tracking device</td></tr>
<tr><td>Model Number:</td><td>LX45-NA</td></tr>
<tr><td>Marketing Name:</td><td>LX41-NA, LT41-NA,
LX42-NA, LT42-NA,
LX43-NA, LT43-NA,
LX44-NA, LT44-NA,
LX45-NA, LT45-NA</td></tr>
<tr><td>HW Version:</td><td>LX45-NA-001</td></tr>
<tr><td>SW Version:</td><td>LX45-NA-001</td></tr>
<tr><td>FCC-ID:</td><td>GKM-LX45</td></tr>
<tr><td>IC:</td><td>10281A-LX45</td></tr>
<tr><td>Radio Information as declared:</td><td><u>Cellular:</u>
• Quectel LPWA BG95-M3
• LTE CAT M1, EGPRS
• LTE: B2, B4, B12, B13, B66 only (other bands will be disabled)
• GSM: 850MHz, 900MHz, 1800MHz, 1900MHz.
<u>Bluetooth:</u>
• Nordic nRF52832 (SoC)
• Bluetooth Low Energy.</td></tr>
<tr><td>Antenna Information as declared:</td><td>
<table>
<tr><td>Bands:</td><td>LTE 2 & GSM 1900</td><td>LTE 4</td><td>LTE 12</td><td>LTE 13</td><td>LTE 66</td><td>GSM 850</td><td>BLE</td></tr>
<tr><td>Max Gain (dBi):</td><td>2.02</td><td>1.21</td><td>-0.79</td><td>-2.98</td><td>2</td><td>-4,5</td><td>0.5</td></tr>
</table>
</td></tr>
<tr><td>Power Supply/ Rated Operating Voltage Range</td><td>Low: 9 VDC, Nom: 12VDC, High: 31VDC</td></tr>
<tr><td>Operating Temperature Range</td><td>Low: -40ºC Norm +25ºC High +85 ºC</td></tr>
<tr><td>Sample Revision</td><td>☐Production ☒ Pre-Production</td></tr>
<tr><td>EUT Dimensions</td><td>68mm x 90mm x 19mm</td></tr>
<tr><td>Weight</td><td>Tracker: 64 grams, Set: 160 grams</td></tr>
<tr><td>EUT Diameter</td><td>☒< 60 cm ☐ Other _____</td></tr>
<tr><td colspan="2">Note: All information provided by the client.</td></tr>
</table>

4 RF Exposure Limits and FCC and IC Basic Rules

4.1 Routine Environmental Evaluation Categorical Exclusion Limits according to FCC 1.1307(b)(3)(i)(B), and FCC 1.1307(b)(3)(ii)(B)

Single RF sources is exempt if 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);

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.

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

4.2 Field reference level (FRL) exposure exemption limits according to RSS-102 Issue 6, section 6.6

Field reference level (FRL) exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f0.5$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10-2 $f0.6834$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the EIRP was derived.

5 Evaluations

5.1 Analysis of RF Exposure for simultaneous transmission

FCC RF Exposure

Radio	Tech-Band	Freq-Low$_{[GHz]}$	Pwr$_{[dBm]}$	Power$_{[W]}$	Ant-G$_{[dBi]}$	EIRP$_{[W]}$	ERP$_{[W]}$	ERP$_{[mW]}$	FCC 2.1093(c)(1) Pth$_{[mW]}$ = ERP$_{20cm}$
Cellurlar	LTE 2	1.8550	21.00	0.126	2.02	0.200	0.122	122.18	3060.00
	LTE 4	1.7150	21.00	0.126	1.21	0.166	0.101	101.39	3060.00
	LTE 12	0.7040	21.00	0.126	-0.79	0.105	0.064	63.97	1436.16
	LTE 13	0.7820	21.00	0.126	-2.98	0.063	0.039	38.64	1595.28
	LTE 66	1.7150	21.00	0.126	2.00	0.200	0.122	121.62	3060.00
	GSM 850	0.8242	32.24	1.675	-4.50	0.594	0.362	362.24	1681.37
	GSM 1900	1.8502	29.83	0.962	2.02	1.531	0.933	933.25	3060.00
Radio	**Tech-Band**	**Freq-Low$_{[GHz]}$**	**Pwr$_{[dBm]}$**	**Power$_{[W]}$**	**AG$_{[dBi]}$**	**EIRP$_{[W]}$**	**ERP$_{[W]}$**	**ERP$_{[mW]}$**	**FCC 2.1093(c)(1) Pth$_{[mW]}$ = ERP$_{20cm}$**
Bluetooth	LE	2.4000	1.70	0.0015	0.50	0.002	0.001	1.01	3060.00

The worst-case simultaneous transmissions are GSM 850 and BTLE.
TER (Total Exposure Ratio) = 0.997
RF exposure exemption applicable

IC RF Exposure

Radio	Tech-Band	Freq-Low [MHZ]	Pwr$_{[dBm]}$	Power$_{[W]}$	Ant-G [dBi]	EIRP$_{[W]}$	Exemption limit for Routine Evaluation
Cellular	LTE 2	1855.00	21.00	0.13	2.02	0.20	2.24
	LTE 4	1715.00	21.00	0.13	1.21	0.17	2.13
	LTE 12	704.00	21.00	0.13	-0.79	0.10	1.16
	LTE 13	782.00	21.00	0.13	-2.98	0.06	1.24
	LTE 66	1715.00	21.00	0.13	2.31	0.20	2.13
	GSM 850	824.20	32.24	1.67	-0.91	0.59	1.29
	GSM 1900	1850.20	29.83	0.96	-4.50	1.53	2.24
Radio	**Tech-Band**	**Freq-Low [MHZ]**	**Pwr$_{[dBm]}$**	**Power$_{[W]}$**	**Ant-G [dBi]**	**EIRP$_{[W]}$**	**Exemption limit for Routine Evaluation**
Bluetooth	LE	2400.00	1.70	0.0015	0.50	0.00	2.67

The worst-case simultaneous transmissions are GSM 1900 and BTLE.
TER (Total Exposure Ratio) = 0.684
RF exposure exemption applicable

6 Revision History

Date	Report Name	Changes to report	Prepared by
2024-11-13	EMC_XIRGG_001_24001_FCC_ISED_RF_Exposure_EX	Initial Release	Cheng Song
2024-11-15	EMC_XIRGG_001_24001_FCC_ISED_RF_Exposure_EX_Rev1	Updated Section 5.1 to reflect the corrected RF output power value	Cheng Song

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