



Radio Frequency Exposure Evaluation Report

FOR:

Xirgo Technologies, LLC

Model Number:

XT4964

Product Description:

Sends reports of location and various sensor information periodically via the cellular network

FCC ID: GKM-XT4964

IC ID: 10281A-XT4964

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 5

Report number: EMC_XIRGO-128-19001_FCC_ISED_MPE

DATE: 2019-11-21



CETECOM Inc.

411 Dixon Landing Road • Milpitas, CA 95035 • U.S.A.

Phone: + 1 (408) 586 6200 • Fax: + 1 (408) 586 6299 • E-mail: info@cetecom.com • <http://www.cetecom.com>

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 5 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	Sends reports of location and various sensor information periodically via the cellular network	XT4964

Report reviewed by: TCB Evaluator

2019-11-21 Compliance Cindy Li
(EMC Lab Manager)

Date	Section	Name	Signature
------	---------	------	-----------

Responsible for the Report:

2019-11-21 Compliance Chin Ming Lui
(Associate EMC Engineer)

Date	Section	Name	Signature
------	---------	------	-----------

Table of Contents

1	Assessment	2
2	Administrative Data	4
2.1	Identification of the Testing Laboratory Issuing the Test Report.....	4
2.2	Identification of the Client	4
2.3	Identification of the Manufacturer	4
3	Equipment under Assessment	5
4	RF Exposure Limits and FCC and IC Basic Rules	7
4.1	Power Density Limits acc. to FCC 1.1310(e) / RSS-102 i5, cl. 4:	7
4.2	Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.109(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):.....	7
4.3	RF Exposure Estimation (MPE Estimation)	7
5	Evaluations	8
5.1	Analysis of RF Exposure for simultaneous transmission	8
5.2	Conclusion:	9
6	Revision History.....	10

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
Lab Manager:	Cindy Li
Responsible Project Leader:	Rami Saman

2.2 Identification of the Client

Applicant's Name:	Xirgo Technologies, LLC
Street Address:	188 Camino Ruiz
City/Zip Code	Camarillo, CA 93012
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Client
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Assessment

Marketing name:	XT4964
HW Version :	XT4964-001
SW Version :	XT4964-01
Hardware Version Identification Number (HVIN):	XT4964
Product Marketing Name (PMN):	XT4964
Regulatory Band:	<ul style="list-style-type: none"> ❖ <u>Cellular Module:</u> <ul style="list-style-type: none"> ▪ GSM 850: 824.2 ~ 848.8 MHz ▪ GSM 1900: 1850.2 ~ 1909.8 MHz ▪ WCDMA/UMTS FDD BAND II: 1852.4 ~ 1907.6 MHz ▪ WCDMA/UMTS FDD BAND IV: 1712.4 ~ 1752.6 MHz ▪ WCDMA/UMTS FDD BAND V: 826.4 ~ 846.6 MHz ▪ LTE BAND 2: 1850 ~ 1910 MHz ▪ LTE BAND 4: 1710 ~ 1755 MHz ▪ LTE BAND 5: 824 ~ 849 MHz ▪ LTE BAND 12: 699 ~ 716 MHz ❖ <u>Bluetooth Low Energy:</u> <ul style="list-style-type: none"> ▪ Nominal band: 2400 MHz – 2483.5 MHz; ▪ Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels
Integrated Module Info:	<ul style="list-style-type: none"> ❖ <u>Cellular Module:</u> <ul style="list-style-type: none"> ▪ Module name: Quectel ▪ Model number: EG25-G(D) ▪ FCC/IC ID: XMR201903EG25G / 10224A-201903EG25G ❖ <u>Bluetooth Low Energy:</u> <ul style="list-style-type: none"> ▪ Module name: Texas Instruments ▪ Model Number: CC2564BRVMR
Antenna Type:	<ul style="list-style-type: none"> ❖ <u>Cellular:</u> <ul style="list-style-type: none"> ▪ Type: PCB ▪ Location: Internal (The Antenna Company) ▪ Antenna Peak Gain: <ul style="list-style-type: none"> ○ GSM 850: 4.0 dBi ○ GSM 1900: 3.3 dBi ○ WCDMA II: 3.3 dBi

	<ul style="list-style-type: none"> ○ WCDMA IV: 3.1 dBi ○ WCDMA V: 4.0 dBi ○ LTE Band 2: 3.3 dBi ○ LTE Band 4: 3.1 dBi ○ LTE Band 5: 4.0 dBi ○ LTE Band 12: 2.4 dBi <p>❖ <u>Bluetooth Low Energy:</u></p> <ul style="list-style-type: none"> ▪ Type: Ceramic Chip ▪ Location: Internal ▪ Antenna Peak Gain: 0.5 dBi
Target TX Output Power1:	<p>❖ <u>Cellular:</u></p> <ul style="list-style-type: none"> ▪ GSM 850: 35 dBm ▪ GSM 1900: 32 dBm ▪ WCDMA Band II: 25 dBm ▪ WCDMA Band IV: 25 dBm ▪ WCDMA Band V: 25 dBm ▪ LTE Band 2: 25 dBm ▪ LTE Band 4: 25 dBm ▪ LTE Band 5: 25 dBm ▪ LTE Band 12: 25 dBm
Peak Output Power:	<p>❖ <u>Bluetooth Low Energy:</u></p> <ul style="list-style-type: none"> ▪ Mid Channel: 11.15 dBm
Power Supply/ Rated Operating Voltage Range:	Low 8VDC, Nominal 12VDC, High 24VDC
Operating Temperature Range:	Low -40° C, Nominal 25° C, High 70° C
Sample Revision:	<input type="checkbox"/> Prototype Unit; <input checked="" type="checkbox"/> Production Unit; <input type="checkbox"/> Pre-Production

Note 1: Target TX Output Power leveraged from Test Report No. "HR/2019/1001601" prepared by SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch for cellular module Quectel EG25-G(D) (FCC ID: XMR201903EG25G, IC ID: 10224A-201903EG25G).

4 RF Exposure Limits and FCC and IC Basic Rules

For the specific described radio apparatus the following basic limits and rules apply for both, FCC and IC where not indicated differently.

4.1 Power Density Limits acc. to FCC 1.1310(e) / RSS-102 i5, cl. 4:

FCC

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100000	1.0	30

IC

300 – 6000	0.02619 x f (MHz) ^{0.6834}	6
------------	-------------------------------------	---

4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.109(c) / RSS-102, cl. 2.5 (rounded to 1 decimal point):

FCC

operating frequency < 1.5GHz: excluded if ERP < 1.5W / 31.8dBm (EIRP: 33.9 dBm);
operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (EIRP: 36.9 dBm);

IC

300MHz <= operating frequency < 6 GHz: excluded if EIRP < 0.0131 x f (MHz)^{0.6834} W

4.3 RF Exposure Estimation (MPE Estimation)

Having available the source based average output power and peak antenna gain or the ERP/EIRP of the specified device and for a known minimum distance of its radiating structures from the body of persons according to its use cases (at least 20cm) the power density at that distance can be estimated by the following formula for plane-wave equivalent conditions (far-field conditions), when ground reflection is neglected.

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density (mW/cm² or W/m²)

P = power input to the antenna (mW or W)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (cm or m)

5 Evaluations

5.1 Analysis of RF Exposure for simultaneous transmission

Frame-Average Tune Up procedure applied for GSM bands:

Radio	Burst Tune Up Output Power (dBm)	Burst Tune Up Output Power (W)	Frame-Average Tune Up Output Power (W)	Frame-Average Tune Up Output Power (dBm)
GSM 850	35.0	3.162	0.39525	25.97
GSM 1900	32.0	1.585	0.198125	22.97

Note: Frame-Average Tune Up Output Power (W) = Burst Tune Up Output Power (W) x 1/8 division factor

- Evaluations are based on worst case power density limits for Canada.
- Calculations are made based on distance of 20cm.
- Evaluations are based on EIRP calculated from known gain and max conducted average output power.
- Cellular can transmit simultaneously with Bluetooth Low Energy.

Radio	Freq [MHz]	Max Conducted Average Output Power [dBm]	Gain [dBi]	Gain [lin]	EIRP [W]	Power Density [mW/cm ²]	FCC Limit [mW/cm ²]	IC Limit [mW/cm ²]	Percentage of limit used up	Verdict
GSM 850	824.2	25.97 ¹	4.0	2.51	0.9931	0.1977	0.55	0.26	76.04%	Pass
GSM 1900	1850.2	22.97 ¹	3.3	2.14	0.4246	0.0843	1.00	0.45	18.73%	Pass
WCDMA II	1852.4	25.00	3.3	2.14	0.6761	0.1346	1.00	0.45	29.91%	Pass
WCDMA IV	1712.4	25.00	3.1	2.04	0.6457	0.1285	1.00	0.43	29.88%	Pass
WCDMA V	826.4	25.00	4.0	2.51	0.7943	0.1581	0.55	0.26	60.81%	Pass
LTE 2	1850	25.00	3.3	2.14	0.6761	0.1346	1.00	0.45	29.91%	Pass
LTE 4	1710	25.00	3.1	2.04	0.6457	0.1285	1.00	0.42	30.60%	Pass
LTE 5	824	25.00	4.0	2.51	0.7943	0.1581	0.55	0.26	60.81%	Pass
LTE 12	699	25.00	2.4	1.74	0.5495	0.1094	0.47	0.23	47.57%	Pass
BTLE	2400	11.15	0.5	1.12	0.0146	0.00291	1.00	0.54	0.54%	Pass

Note 1: Max Conducted Average Output Power for GSM bands obtained from Frame-Average Tune Up procedure

Note 2: Max Conducted Average Output Power for WCDMA and LTE bands based on Target TX Output Power

Note 3: Calculation based on distance of 20cm and highest power

5.2 Conclusion:

The worst-case simultaneous transmission is GSM 850 simultaneous with BTLE, which is using 76.58% of the limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2019-11-21	EMC_XIRGO-128-19001_FCC_ISED_MPE	Initial Release	Chin Ming Lui