



Radio Frequency Exposure Evaluation Report

FOR:

Xirgo Technologies, LLC

Model number:
XT4975A

Product Description:
Energy Harvesting Smart Trailer Solution

FCC ID: GKM-XT4975A
IC ID: 10281A-XT4975A

Applied Rules and Standards:

CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091),
ISED RSS-102 Issue 5

Report number: EMC_XIRGO-122-17001_FCC_ISED_MPE

DATE: 04-18-2018



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3462B-2

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1. Assessment

This RF Exposure shows compliance of the below identified device to the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091), and ISED standard RSS-102, for distances to human body of 25 cm and more.

Company Name	Product Description	Model #
Xirgo Technologies, LLC	Energy Harvesting Smart Trailer Solution	XT4975A

Responsible for Evaluation:

2018-04-18	Compliance	James Donnellan (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2018-04-18	Compliance	Elijah Garcia (EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.
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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:	James Donnellan
Responsible Project Leader:	Sangeetha Sivaraman

2.2. Identification of the Client / Manufacturer

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 applicant.
Manufacturers Address:	-----
City/Zip Code	-----
Country	-----
Contact	-----
Phone No.	-----
e-mail:	-----

3. Equipment under Assessment

Model No	XT4975A
HW Version	XT4975A-001
SW Version	XT4975A-01
FCC-ID	GKM-XT4975A
IC-ID	10281A-XT4975A
Product Description	Energy Harvesting Smart Trailer Solution
Transceiver Technology / Type(s) of Modulation	ublox TOBY-R200; FCC ID: XPY1EHM44NN; IC ID: 8595A-1EHM44NN •850/1900 MHz GSM/GPRS/EDGE; GSM&GPRS&EDGE(MCS-1-4): GMSK; EDGE(MCS-5-9): 8PSK; •850/1900 MHz WCDMA / HSPA; HSDPA Category 8 data rate – 7.2 Mbps; HSUPA Category 6 data rate - 5.76 Mbps; modulation: all QPSK (no QAM in uplink for given data rates) •850/1700/1900/700 MHz LTE; LTE Band 2 (PCS),4 (AWS),5 (850),12 (700) Bluetooth LE: TI's CC2564 Bluetooth version 4.0, Low Energy, using Dynamic Sequence Spread Spectrum with GFSK modulation.

Frequency Range	GSM 850: 824.2-848.8 MHz; 123 channels; PCS 1900: 1850.2-1909.8 MHz; 298 channels; FDD V: 826.4 - 846.6 MHz; 101 channels; FDD II: 1852.4 – 1907.6 MHz; 276 channels; LTE Band 2: 1850 - 1910 MHz; 60 MHz bandwidth; LTE Band 4: 1710 - 1755 MHz; 45 MHz bandwidth; LTE Band 5: 824 - 849 MHz; 25 MHz bandwidth; LTE Band 12: 699- 716 MHz; 17 MHz bandwidth; Bluetooth LE Nominal band: 2400 MHz – 2483.5 MHz; Center to center: 2402 MHz (Ch. 0) – 2480 MHz (Ch. 39), 40 channels
Max. declared antenna gain	Taoglas antenna solutions, Part No: PCS.06.A Havok; Peak Gain: 0.5dBi.
Co-located Transmitters/ Antennas?	Yes – the 2 radio modules operate independently and may transmit simultaneously
Power Supply/ Rated Operating Voltage Range	8 VDC (Low) / 12 VDC (Nominal) / 24 VDC (Max)
Operating Temperature Range	–40°C ~ 70°C
Sample Revision	☐ Prototype ☒ Production ☐ Pre-Production
Device Category	☐ Fixed Installation ☒ Mobile ☐ Portable
Exposure Category	☒ Occupational/ Controlled ☐ General Population/ Uncontrolled

4. RF Exposure Limits

For the specific described radio apparatus the following basic limits and rules apply

4.1. Power Density Limits acc. to FCC 1.1310(e)

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
1500 – 100.000	1.0	30

4.2. Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.1091(c)

- Operating frequency > 1.5 GHz: excluded if ERP < 3.0W / 34.8dBm;

Per KDB 447498 D01 FCC allows calculative estimation of RF exposure for mobile applications when routine environmental evaluation categorical exclusion applies and also for fixed applications. When categorical exclusion cannot be claimed for mobile applications MPE measurement is required for TCB approval.

4.3. Exemption Limits for Routine Evaluation to RSS-102 2.5.2

RF 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, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. 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 $22.48/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- 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 $1.31 \times 10^{-2} f^{0.6834}$ 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).

4.4. Exposure Limits RSS-102 4

For the purpose of this standard, ISDEC has adopted the SAR and 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)
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6

4.5. 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. Routine Environmental Evaluation Applicability Stand Alone transmission

Transmission Mode	EIRP dBm	Duty Cycle %	Limits for Routine Environmental Evaluation Applicability, EIRP dBm	Exempt from Routine evaluation (Yes/No)
GSM 850	33.97	50	< 31.17	No. evaluation carried out in 5.2
GSM 1900	33.37	50	< 33.6	Yes
UMTS V	24.77	100	< 31.17	Yes
UMTS II	27.17	100	< 33.6	Yes
LTE Band 2	26.67	100	< 33.6	Yes
LTE Band 4	26.67	100	< 33.34	Yes
LTE Band 5	24.27	100	< 31.17	Yes
LTE Band 12	24.27	100	< 30.68	Yes
BTLE	10.5	100	< 34.38	Yes

Note: EIRP Power is based on Max power values for the modules and the declared antenna gains of the host.

5.2. Compliance with MPE (Power Density) limits

Power Density Calculation								
Band of Operation MHz	EIRP dBm	Maximum Duty Cycle %	Distance cm	Power Density mW/cm ²	Limit ISED mW/cm ²	Limit FCC mW/cm ²	Percentage of ISED Limit	Verdict
GSM 850	33.97	50	20	0.248	0.26	< 0.566	0.964	Pass
GSM 1900	33.37	50	20	0.216	0.45	< 1.000	0.483	Pass
UMTS V	24.77	100	20	0.060	0.26	< 0.566	0.232	Pass
UMTS II	27.17	100	20	0.104	0.45	< 1.000	0.232	Pass
LTE Band 2	26.67	100	20	0.092	0.45	< 1.000	0.207	Pass
LTE Band 4	26.67	100	20	0.092	0.42	< 1.000	0.218	Pass
LTE Band 5	24.27	100	20	0.053	0.26	< 0.566	0.207	Pass
LTE Band 12	24.27	100	20	0.053	0.23	< 0.477	0.231	Pass
BTLE	10.5	100	20	0.002	0.53	< 1.000	0.004	Pass

Note: EIRP power calculation is based on the Max power values for the module and the declared antenna gains of the host.

Conclusion:

- The equipment fulfills the MPE limits for the minimum 20cm distance between the antenna and the human body

6. Routine Environmental Evaluation Applicability Simultaneous Transmission

- Possible simultaneous transmissions: According to the manufacturer the three radio modules incorporated within the device operate independently from each other. Theoretically the worst case of simultaneous transmission is with two transmitters operating at the highest output power mode, within the same band (Wi-Fi+ GSM 850 + BT).

Transmission Mode	Sum of the Ratios for the Highest Possible Simultaneous Operation	Limits for the Highest Combined Ratio
GSM 850 + BTLE	0.964+ 0.004 = 0.97	< 1

Conclusion:

- The equipment meets the MPE requirements limits for simultaneous transmission for distance greater 20 cm.

7. Revision History

Date	Report Name	Changes to report	Report prepared by
04-18-2018	EMC_XIRGO-122-17001_FCC_ISED_MPE	Initial Version	Elijah Garcia