



# 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



A2LA Accredited

IC recognized #  
3462B-2

## **CETECOM Inc.**

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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 ISEDC 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<br>(Lab Manager) |           |
|------------|------------|----------------------------------|-----------|
| Date       | Section    | Name                             | Signature |

### Responsible for the Report:

| 2018-04-18 | Compliance | Elijah Garcia<br>(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;<br>FCC ID: XPY1EHM44NN; IC ID: 8595A-1EHM44NN<br>•850/1900 MHz GSM/GPRS/EDGE;<br>GSM&GPRS&EDGE(MCS-1-4): GMSK; EDGE(MCS-5-9): 8PSK;<br>•850/1900 MHz WCDMA / HSPA;<br>HSDPA Category 8 data rate – 7.2 Mbps;<br>HSUPA Category 6 data rate - 5.76 Mbps;<br>modulation: all QPSK (no QAM in uplink for given data rates)<br>•850/1700/1900/700 MHz LTE;<br>LTE Band 2 (PCS),4 (AWS),5 (850),12 (700)<br><br>Bluetooth LE: TI's CC2564<br>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;<br>PCS 1900: 1850.2-1909.8 MHz; 298 channels;<br>FDD V: 826.4 - 846.6 MHz; 101 channels;<br>FDD II: 1852.4 – 1907.6 MHz; 276 channels;<br>LTE Band 2: 1850 - 1910 MHz; 60 MHz bandwidth;<br>LTE Band 4: 1710 - 1755 MHz; 45 MHz bandwidth;<br>LTE Band 5: 824 - 849 MHz; 25 MHz bandwidth;<br>LTE Band 12: 699- 716 MHz; 17 MHz bandwidth;<br><br>Bluetooth LE<br>Nominal band: 2400 MHz – 2483.5 MHz;<br>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/<br>Antennas?          | Yes – the 2 radio modules operate independently and may transmit simultaneously   |
| Power Supply/ Rated<br>Operating Voltage Range | 8 VDC (Low) / 12 VDC (Nominal) / 24 VDC (Max)   |
| Operating Temperature<br>Range                 | -40°C ~ 70°C  |
| Sample Revision                                | <input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production   |
| Device Category                                | <input type="checkbox"/> Fixed Installation <input checked="" type="checkbox"/> Mobile <input type="checkbox"/> Portable  |
| Exposure Category                              | <input checked="" type="checkbox"/> Occupational/ Controlled <input type="checkbox"/> 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 <sup>2</sup> ) | 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, ISEDC has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6

| Frequency Range (MHz) | Electric Field (V/m rms) | Magnetic Field (A/m rms) | Power Density (W/m <sup>2</sup> ) | 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/cm<sup>2</sup> or W/m<sup>2</sup>)

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 <sup>2</sup> | Limit ISED mW/cm <sup>2</sup> | Limit FCC mW/cm <sup>2</sup> | 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      |