



Radio Frequency Exposure Evaluation Report

For

Xirgo Technologies, Inc

GPS Asset Tracking Device

FCC ID: GKM-XT4850C

IC ID: 10281A-XT4850C

Model No.: XT-4850C

Applied Rules and Standards

**CFR Part Part 1 (1.1307 &1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General 24 RF Exposure Guidance v05r02**

Industry Canada RSS-102, Issue 5 of March 2013

Report number: EMC_XIRGO-093-15001_MPE

DATE: 05-13-2015

1 Administrative Data

1.1 Identification of the Testing Laboratory Issuing the Test Report

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Compliance Manager:	Franz Engert
Responsible Project Leader:	Douglas Antioco

1.2 Identification of the Client / Manufacturer

Applicant's Name:	Xirgo Technologies, Inc
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City/Zip Code	Camarillo, CA/ 93012
Country	USA
Contact Person:	Nader Barakat
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2 Equipment under Assessment

Marketing Name / Description:	GPS Asset Tracking Device
FCC-ID:	GKM-XT4850C
IC certification no.:	10281A-XT4850C
Model Number:	XT-4850C
Product Description:	GPS Asset Tracking Device
Transmitter information:	1. pre-certified CDMA 1xRTT 800/1900 Mhz radio module uBlox LISA-C200; FCC ID: R5Q-LISAC200A / IC ID: 8595B-LISAC200A 2. ZigBee IEEE 802.15.4 (2.4GHz); 3. GPS 1575.42 MHz
Antennae:	Internal Monopole, 850MHz: -2 dBi 1900MHz: 0 dBi
Co-located Transmitters/ Antennas?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Device Category:	<input checked="" type="checkbox"/> Fixed Installation <input type="checkbox"/> Mobile (mark mobile if both possible) <input type="checkbox"/> Portable <input type="checkbox"/> mixed Mobile and Portable
Exposure Category:	<input type="checkbox"/> Occupational/ Controlled <input checked="" type="checkbox"/> General Population/ Uncontrolled
Rated Operating Voltage:	Vmin: 9VDC/ Vnom: 12VDC/ Vmax: 24VDC
Rated Operating temperature range:	Tmin: -30°C / Tmax: 70°C
Test Sample Status:	Pre-production

3 Assessment

This RF Exposure evaluation report provides information about 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 given 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.

Company	Description	Model #
Xirgo Technologies, Inc	GPS Asset Tracking Device	XT-4850C

Report reviewed by:

2015-05-13	Compliance	Heiko Strehlow (Chief Operating Officer)	Signing on Behalf of Franz Engert (Compliance Manager)
Date	Section	Name	Signature

Responsible for the Report:

2015-05-13	Compliance	Douglas Antioco (EMC Engineer)	
Date	Section	Name	Signature

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 – 100.000	1.0	30

IC

300 – 6000	$0.02619 \times f \text{ (MHz)}^{0.6834}$	6
1500 – 100.000	1.0	30

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

IC

300MHz < = operating frequency < 6 GHz: excluded if EIRP < $0.0131 \times f \text{ (MHz)}^{0.6834}$

4.3 EMC Output Power Limits (ERP/EIRP) acc. to FCC part 22/24 / IC RSS-132, RSS-133 (to be additionally taken into account for maximum antenna gain considerations)

part 22: 7W ERP / 38.5dBm (IC: 11.5W / 40.6dBm EIRP)

part 24: 2W EIRP / 33.0dBm

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 can not be claimed for mobile applications MPE measurement is required for TCB approval.

RSS-102 of Industry Canada does generally not require RF exposure evaluation for fixed or mobile applications which stay below the given exclusion limits.

4.4 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 it's radiating structures from the body of persons according to it's 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

Based on the maximum EIRP results from the associate emc report provided with this filing.

Transmission Mode	max. EIRP	duty cycle	total EIRP simultaneous transmissions intra-band (worst cases only)	FCC / IC Limits for Routine Environmental Evaluation Applicability, EIRP	excluded?
	dBm	%	dBm	dBm	
CDMA 850	28.1	100	n.a.	33.9 / 31.1	yes
CDMA 1900	30.5	100	n.a.	36.9 / 33.5	yes
ZigBee 2.4 GHz	11.3	100	n.a.	36.9 / 34.3	yes

Result: The transmitters in the equipment are categorically excluded from Routine Environmental Evaluation. There are no intra-band co-transmissions possible in the device.

5.2 Compliance with MPE (Power Density) limits

Limits:

S_{max} @ 824MHz = 0.55mW/cm² (824MHz is worst case as lowest operating frequency in the cellular band);

S_{max} @ 1850MHz and @ 2400MHz = 1.0mW/cm²

The highest power density is resulting from the formula: $S = EIRP / 4\pi r^2$;

The power density is calculated for the minimum distance $r = 20\text{cm}$;

Highest source base time averaged EIRP with CDMA 850 MHz: 28.1 dBm;

Resulting maximum power density at 850MHz: **S(850MHz) = 0.13 mW/cm²**

Highest source base time averaged EIRP with CDMA 1900 MHz: 30.5dBm;

Resulting maximum power density at 1900MHz: **S(1900MHz) = 0.22 mW/cm²**

Highest source base time averaged EIRP with WLAN 2.4GHz: 11.3dBm;

Resulting maximum power density at 2400MHz: **S(2400MHz) = 0.002mW/cm²**

Result: The equipment fulfills the MPE limits for the minimum distance between the antenna and the human body of 20cm.

5.3 Simultaneous Transmission MPE Test Exclusion (per KDB 447498 D01)

Possible simultaneous transmissions: Cellular Radio and ZigBee.

Highest power density to the limit ratio for the Cellular Transmitter: $0.22 \text{ mW/cm}^2 / 0.55 \text{ mW/cm}^2 = 0.4$

Power density to the limit ratio for the WLAN Transmitter: $0.002 \text{ mW/cm}^2 / 1.0 \text{ mW/cm}^2 = 0.002$

Σ of Power Density (MPE) ratios = $0.4 + 0.002 = 0.402 < 1$

Result: The equipment is excluded from simultaneous transmission MPE test.

5.4 Maximum allowed Antenna Gain – Gmax

not applicable since fixed internal antenna is used in the product.

6 Revision History

Date	Report Name	Changes to report	Report prepared by
2015-05-13	EMC_XIRGO-093-15001_MPE	First Version	Douglas Antioco