



Radio Frequency Exposure Evaluation Report

For

Xirgo Technologies, Inc.

Wireless Zigbee Sensor

FCC ID: GKM-XT1000

IC ID: 10281A-XT1000

Model No.: XT-1010

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 4 of March 2010

Report number: EMC_XIRGO-079-14001_MPE_XT-1010

DATE: 2014-09-8

1 Administrative Data

1.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
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Compliance Manager:	Franz Engert

1.2 Identification of the Client / Manufacturer

Applicant's Name:	Xirgo Technologies, Inc
Street Address:	188 Camino Ruiz
City/Zip Code	Camarillo, CA/ 93012
Country	USA
Contact Person:	Nader Barakat
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2 Equipment under Assessment

Marketing Name / Description:	Wireless Zigbee Sensor
FCC-ID:	GKM-XT1000
IC certification no.:	10281A-XT1000
Model Number:	XT-1010
Product Description:	Sensor with Zigbee Transmitter
Transmitter information:	ZigBee IEEE 802.15.4 (2.4GHz);
Antennae:	SMD
Co-located Transmitters/ Antennas?	none
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: 8.0V/ Vnom: 12.0V/ Vmax: 24V, supplied by solar or car battery;
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 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	Wireless Zigbee Sensor	XT-1010

Report reviewed by:

2014-09-08 Compliance Franz Engert
(Compliance Manager)

Date	Section	Name	Signature
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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 Maximum Permissible Exposure (MPE) Limits acc. to FCC 1.1310(e) / RSS-102, cl. 4.2:

Frequency Range (MHz)	Power density (mW/cm ²)	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30 (IC:6)
1500 – 100.000 (IC:1500 – 150000)	1.0	30 (IC: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):

Operating frequency < 1.5GHz: excluded if ERP < 1.5W / 31.8dBm (IC: 2.5W / 34.0dBm EIRP);
Operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (IC: 5.0W / 37.0dBm EIRP);

4.3 EMC Output Power Limits (ERP/EIRP) acc. to FCC part 15.247 / IC RSS-210, (to be additionally taken into account for maximum antenna gain considerations)

FCC part 15.247 and IC RSS-210 Annex 8: 4W EIRP

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

Transmission Mode	Pr	peak gain	attenuation	duty cycle	EIRP, source based time averaged (EIRPmax)	total EIRP simultaneous transmissions intra-band (worst cases only)	FCC & IC Limit for Routine Environmental Evaluation Applicability, EIRP	excluded?
	dBm	dBi	dB	%	dBm	dBm	dBm	
ZigBee 2.4 GHz	10.8	0.5	n.a.	100	11.3	n.a.	36.9	yes

Result: The transmitter in the equipment is 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:

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

Smax @ 1900MHz and @ 2400MHz = 1.0mW/cm²

The highest source base time averaged EIRPmax per band calculated with the rated peak antenna gain values are taken from the table in section 5.1 above;

The highest power density is resulting from the formula: $S = \text{EIRPmax} / 4 * \pi * r^2$;

The power density is calculated for the minimum distance $r = 20\text{cm}$ (which is a very unlikely narrow distance for the device under consideration);

Highest source base time averaged EIRP with Zigbee 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, for the rated peak antenna gain.

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

n.a.

5.4 Maximum allowed Antenna Gain – Gmax

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

6 Revision History

Date	Change Description	Revision
2014-09-08	Initial version	initial