



Radio Frequency Exposure Evaluation Report

FOR:

Telular Corporation

Model:

GXT5002C

Product Description:

The GXT5002C is a solar powered GPS asset management solution that provides enhanced asset utilization and cargo visibility

Applied Rules and Standards:

CFR 47 Part 2 (2.1093),

FCC KDB 447498 D01 General RF Exposure Guidance v06

ISED RSS-102 Issue 5

FCC ID: MTFGXT5002C

IC ID: 2175D-GXT5002C

Report number: EMC_TELUL-073-18001_FCC_ISED_MPE

DATE: 2018-03-21

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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 #
Telular	The GXT5002C is a solar powered GPS asset management solution that provides enhanced asset utilization and cargo visibility	GXT5002C

Responsible for Testing Laboratory:

2018-03-21	Compliance	James Donnellan (EMC Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

2018-03-21	Compliance	Chaman Bhardwaj (Sr. 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.
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Country	USA
Telephone:	+1 (408) 586 6200
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EMC Lab Manager:	James Donnellan
Responsible Project Leader:	Chaman Bhardwaj

2.2. Identification of the Client / Manufacturer

Applicant's Name:	Telular Corporation.
Street Address:	3225 Cumberland Blvd. Suite 300
City/Zip Code	Atlanta, GA 30339
Country	USA
Contact Person:	Leslie Mishrell
Phone No.	1 + (678) 264-2007
e-mail:	lmishrell@telular.com

3. Equipment under Assessment

Model No	GXT5002C
HW Version	01
SW Version	RHL7688.A.2.10.4
FCC-ID	MTFGXT5002C
IC ID	2175D-GXT5002C
HVIN	GXT5002C
PMN	Falcon GXT5002C
Product Description	The GXT5002C is a solar powered GPS asset management solution that provides enhanced asset utilization and cargo visibility
Device Category	<input type="checkbox"/> Fixed Installation <input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable <input type="checkbox"/> Mixed Mobile and Portable
Frequency Range / number of channels	GSM 850: 824.2-848.8; 125 channels; PCS 1900: 1850.2-1909.8; 300 channels; FDD V: 826.4 - 846.6; 278 channels; FDD II: 1852.4 – 1907.6; 103 channels;
Type(s) of Modulation	Sierra HL7688; HW Rev 1.0, SW Rev. T1.0.3.2 FCC ID: N7NMC7688; IC ID: 2175D-GXT5002C •850/900/1700/1800/1900MHz GSM/GPRS/EDGE; GSM&GPRS&EDGE(MCS-1-4): GMSK; EDGE(MCS-5-8): 8PSK; •850/900/1700/1900/2100 MHz WCDMA / HSPA+; HSDPA Category 14 data rate - 21 Mbps; HSUPA Category 6 data rate - 5.76 Mbps; modulation: all QPSK (no QAM in uplink for given data rates)
Modes of Operation	Cellular: Sierra Wireless HL7688: UMTS Bands II and V; LTE Bands 2,4,5,17 with ISM 20 channels (902-928 MHz)
Declared ISM Radio Output power	Conducted Power 20.01 dBm
Max. declared antenna gain	3.9dBi for Cellular; For ISM 0.8dBi
Minimum distance of antenna or radiating parts to user	≥ 20 cm
Power Supply/ Rated Operating Voltage Range	17 VDC max, nominal 12 VDC, Low 6.2 VDC
Operating Temperature Range	- 30° C to +70°C
Other Radios included in the device	ISM; 902MHz to 928MHz GPS
Co-located Transmitters / Antennas	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Sample Revision	<input type="checkbox"/> Prototype <input checked="" type="checkbox"/> Production <input type="checkbox"/> Pre-Production
Exposure Category	<input type="checkbox"/> Occupational/ Controlled <input checked="" type="checkbox"/> General Population/ Uncontrolled

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

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 to Exclude Routine RF Exposure evaluation for Stand Alone Operation

band	lowest frequency [MHz]	FCC EIRP limit	IC EIRP limit in W	IC EIRP limit in dBm	EIRP in dBm	Verdict
UMTS II	1850.00	36.900	2.24	33.50	28.90	Exempt
UMTS V	824.00	33.900	1.29	31.11	28.90	Exempt
LTE 2	1850.00	36.900	2.25	33.51	28.90	Exempt
LTE 4	1710.00	36.900	2.13	33.28	28.90	Exempt
LTE 5	824.00	33.900	1.29	31.12	28.90	Exempt
LTE 17	704.00	33.900	1.16	30.64	28.90	Exempt
ISM	902	33.900	1.37	31.37	20.81	Exempt

The single radios are exempt from routine environmental evaluation.

5.2 Analysis of RF Exposure for simultaneous transmission

Standalone MPE analysis:

- Evaluations are based on worst case power density limits for Canada.
- Calculations are made for 20cm.
- Evaluations are based on EIRP measured or calculated from known gain and conducted output power.
- Cellular and ISM can transmit simultaneously

Radio	freq MHz	EIRP in W	Canada W/m2	Actual W/m2	How much of limit is used up
Band II	1852.4	0.78	4.480	1.544	34.46%
Band V	826.4	0.78	2.581	1.544	59.83%
Band 2	1857.5	0.78	4.489	1.544	34.40%
Band 4	1717.5	0.78	4.255	1.544	36.29%
Band 5	829	0.78	2.586	1.544	59.70%
Band 17	704	0.78	2.313	1.544	66.76%
ISM	902	0.12	2.740	0.240	8.75%

Conclusion:

- The worst case simultaneous transmission is Band V or Band 5 simultaneous with ISM which is using $59.70+8.75 = 68.45\%$ of a limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.

5.3 Routine Environmental Evaluation Applicability Simultaneous Transmission

Possible simultaneous transmissions: According to the manufacturer, the two 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 (ISM+ Band 5).

Transmission Mode	Sum of the Ratios for the Highest Possible Simultaneous Operation	Limits for the Highest Combined Ratio	Exempt from Routine evaluation
ISM + Band 5	$0.087 + 0.60 = 0.69$	< 1	Yes

Note: Power Density to Applicable limit for Stand Alone Operation are derived from table in section 5.2

Conclusion:

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

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6 Revision History

Date	Report Name	Changes to report	Report prepared by
2018-03-21	EMC_TELUL-073-18001_FCC_ISED_MPE	Initial version	Chaman Bhardwaj



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