

Test Report

Prepared for Xirgo Technologies, LLC

This report presents Maximum Permissible Exposure for

XT2594

FCC ID: GKM-XT2594

IC ID: 10281A-XT2594

Test Model: XT2594

FVIN: XT2594-01

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Report No: FCC_SL02152022-XIR-001_MPE

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1 TEST REQUEST INFORMATION

Test Requested By: Xirgo Technologies, LLC
1461 Lawrence Drive, Suite 1, Thousand Oaks, CA 91320

Test item Description: The XT2594 is a plug-n-play universal vehicle tracking unit that connects to a light duty or passenger vehicle's OBD-II port and can also be used in heavy duty trucks with 9-pin/6-pin Deutsch connectors via a cable harness/adaptor

DUT Sample Number: N/A
Hardware Version of DUT: Final Production
Software Version of DUT: Property software of Xirgo
Category of DUT: Mobile Exposure; General Population / Uncontrolled Exposure

FCC ID(s): XMR201912BG77 - Cellular/LTE Band
GKM-XT2594 – BLE

IC ID(s): 10224A-201912BG77 - Cellular/LTE Band
10281A-XT2594 – BLE

Type of Test: FCC Exposure Exemption Calculation
References: KDB 447498 v06
FCC CFR Title 47, Chapter I, Subchapter A, Subpart I, Part 2.1091
47CFR 2.1091
RSS-102 Issue 5

Deviations from standard: None

Date of Evaluation: 05/20/2022

2 TEST LABORATORY INFORMATION

Location of Test Lab: Bureau Veritas Consumer Product Services, Inc.
775 Montague Expressway
Milpitas, CA 95035
Phone: +1-925-963-4420

Key Contact: Suresh Kondapalli
Phone: +1-925-963-4420

Laboratory Accreditations: BUREAU VERITAS CONSUMER PRODUCTS SERVICES, INC is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories.

ISO/IEC 17025:2017: 2742.01
FCC Test Site Number: US1109 (540430)
IC Test Site Number: US0160 (4842D)

3 RF EXPOSURE SUMMARY

Test	Reference FCC	Reference ISED Canada	Result
Radio frequency Radiation Exposure Evaluation	47 CFR§2.1091	RSS-102 Issue 5	Complies

3.1 RF EXPOSURE LIMITS

In this document, we evaluate the RF Exposure to human body due the intentional transmission from the transmitter (EUT). The limits for Maximum Permissible Exposure (MPE) specified in FCC 1.1310 and RSS-102 are followed.

3.1.1 FCC LIMITS

According to FCC 1.1310 table 1: The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A)Limits For Occupational / Control Exposures				
0.3 – 3.0	614	1.63	*100	6
3.0 – 30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300 - 1500	...	...	F/300	6
1500 - 100,000	...	...	5	6
(B)Limits For General Population / Uncontrolled Exposure				
0.3 – 1.34	614	1.63	*100	30
1.34 – 30	824/f	2.19/f	*180/f ²	30
30 – 300	27.5	0.073	0.2	30
300 - 1500	...	...	F/1500	30
1500 - 100,000	...	...	1.0	30

F = Frequency in MHz

* = plane wave equivalent density

3.1.2 ISED CANADA LIMITS

According to RSS-102, ISED Canada 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)
0.003-10	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.

* Based on nerve stimulation (NS).

** Based on specific absorption rate (SAR).

4 TEST RESULTS

4.1 CLASSIFICATION

The antenna of the product, under normal use condition, is at least 20 cm away from the body of the user and accessible to the end user. Therefore this device is classified as Mobile Device.

Warning statement to the user for keeping at least 20 cm or more separation distance with the antenna should be included in user's manual.

This device contains one pre-certified Module
FCC ID: XMR201912BG77

Antenna information

FCC ID	Antenna Type	Antenna Gain (dBi)
XMR201912BG77	Internal PCB Antenna ¹	4.0

Note:

1. Internal PCB Antenna used for this device is Antenna Company AC31503-01 antenna (ANT-0088).

4.2 CALCULATION RESULT OF SINGLE RF SOURCE(S)

For FCC Limits

Device Function	FCC ID	Frequency (MHz)	Max Power (dBm)	Max Power (EIRP)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
Cellular/LTE Band	XMR201912BG77	824-849	21.64	25.64	4.0	20	0.0729	0.550
BLE	GKM-XT2594	2400-2483.5	-1.91	-0.41	1.5	20	0.00018	1

Note: Max conducted power taken test report Report No.: FCC_IC_SL02152022-XIR001B_2.4G_CS35235_CS35236

CALCULATION RESULT OF SIMULTANEOUS RF SOURCES

The formula of calculated the MPE is:

$$(CPD1 / LPD1) + (CPD2 / LPD2) + \dots \text{etc.} < 1$$

CPD = Calculated power density

LPD = Limit of power density

$$0.0729/0.550 + 0.00018/1 = 0.1327 < 1$$

For CANADA Limits

Device Function	FCC ID	Frequency (MHz)	Max Power (dBm)	Max Power (EIRP)	Antenna Gain (dBi)	Distance (cm)	Power Density (W/m ²)	Limit (W/m ²)
Cellular/LTE Band	XMR201912BG77	824-849	21.64	25.64	4.0	20	0.7290	2.576
BLE	10281A-XT2594 Host device	2400-2483.5	-1.91	-0.41	1.5	20	0.0018	5.348

Note: 10 W/m² = 1 mW/cm²

The formula of calculated the MPE is:

$$(CPD1 / LPD1) + (CPD2 / LPD2) + \dots \text{etc.} < 1$$

CPD = Calculated power density

LPD = Limit of power density

$0.7290/2.576 + 0.0018/5.348 = 0.2833 < 1$

Note 1: Reference information from FCC grant of module with FCC ID: XMR201912BG77 and report number R1909A0576-M1. Xirgo using the antenna model AC31503-01 (ANT-0088).

Note 2: The above calculations are for simultaneous operation of BLE and Cellular/ LTE bands

Note 3: The host device is being processed under FCC ID: GKM-XT2594 and IC ID: 10281A-XT2594.

5 CONCLUSION

The worst-case summation of MPE ratios for simultaneous transmission are less than 1 for FCC & CANADA, therefore the XT2594 manufactured by Xirgo Technologies, LLC is compliant with Maximum Permissible Exposure requirements.

6 MPE CALCULATION FORMULA

$$S = \frac{P_{out}G}{4\pi R^2}$$

Where:

S = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

R = distance between observation point and centre of the radiator in cm

7 DOCUMENT REVISIONS

Version	Date	Modifier	Changes
1	05/12/2022	Pooja Pandya	Initial release
1A	08/22/2022	James Ma	Correction by comments

End of Report