

Test report No:  
**4288ERM.006A3**

## Assessment report

### RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1091; FCC 47 CFR Part 1.1307 FCC 47 CFR Part 1.1310

(*) Identification of item tested	A04811
(*) Trademark	GARMIN
(*) Model and /or type reference tested	zumo R1 Radar; A04811
Other identification of the product	FCC ID: IPH-04811
(*) Features	2.4 GHz
Manufacturer	Garmin International Inc. 1200 east 151st street, Olathe, KS 66062, USA
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. FCC 47 CFR Part 1.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared. FCC 47 CFR Part 1.1310: Radiofrequency radiation exposure limits.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	07-18-2024
Report template No	FERMUSA_199 (*) "Data provided by the client"

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## Competences and guarantees

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## Data provided by the client

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The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consist of lower power transmitter.

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

## Identification of the client

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Garmin International Inc.  
1200 east 151st street,  
Olathe, KS 66062,  
USA

## Document history

Report number	Date	Description
4288ERM.006	03-29-2024	First release.
4288ERM.006A1	05-03-2024	Second release. Product name and the applicant's information were modified on the cover page. This modification of test report cancels and replaces the test report 4288ERM.006
4288ERM.006A2	05-28-2024	Third release. Page1. It was updated the Model and /or type reference. This modification of test report cancels and replaces the test report 4288ERM.06A1
4288ERM.006A3	07-18-2024	Fourth release. The identification of item tested, and model or type reference is updated. This modification of test report cancels and replaces the test report 4288ERM.006A2

## Appendix A: FCC RF Exposure Evaluation

## General description of the device under evaluation

The device under evaluation consists of rear facing radar for motorcycles.

According to the manufacturer, during its normal use, the separation distance between the radiating structures of the device and nearby users will be greater than 20 cm. In order to perform the assessment a conservative evaluation distance of 20 cm has been used.

As stated into DEKRA Certification Inc. test report num. 4235ERM.005 and 23C0817R-RFUSV14S-A, the maximum measured output power levels for each supported technology are:

Technology / Mode	Band	Frequency (MHz)	Maximum Conducted Output Power (dBm)	Antenna peak gain (dBi)	Maximum E.R.P. (dBm)	Maximum E.R.P. (mW)
BTLE	2.4 GHz	2400 - 2483,5	4.50	0.00	2.35	1.72
Radar	76 - 81 GHz	77700 - 80231	-	-	15.95	39.36

**Table 1:** Equipment specifications

## Evaluation Results

**RF Exposure Exemption evaluation:**

Technology / Mode	Band	Frequency (MHz)	Distance (cm)	Maximum E.R.P. (mW)	§1.1307(b)(3).i.(C) Exposure Limit (mW)	Verdict
BTLE	2.4 GHz	2400 - 2483,5	20.00	1.72	768.00	Pass
Radar	76 - 81 GHz	77700 - 80231	20.00	39.36	768.00	Pass

**Table 2:** FCC Exemption Evaluation Results

The computed value(s) are below the limit(s), so these modes meet the requirements stated in FCC 47 CFR Part 1.1307.

**Simultaneous Transmission assessment:**

The device under evaluation is able to transmit simultaneously Radar and Bluetooth Low energy technologies.

Simultaneous technologies and modes	Result ( $\sum$ of Pout/Pmax ratios)	Verdict ( $\sum \leq 1$ )
BTLE 2.4 GHz + Radar 76 - 81 GHz	0.05	Pass

**Table 3:** Simultaneous Transmission Assessment

## Appendix B: FCC RF Exposure information



## RF Exposure determination of exemption

According to FCC 47 CFR §1.1307 (b)(3) Determination of exemption:

(i) For single RF sources (i.e., any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2), a single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P<sub>th</sub> (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P<sub>th</sub> is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

$d$  = the separation distance (cm);

(C) Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of  $\lambda/4$  or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

TABLE 1 TO §1.1307(b)(3)(i)(C)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$ .
1.34-30	$3,450 R^2/f^2$ .
30-300	$3.83 R^2$ .
300-1,500	$0.0128 R^2 f$ .
1,500-100,000	$19.2 R^2$ .

(ii) For multiple RF sources: Multiple RF sources are exempt if:

(A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).

(B) in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(B) of this section for P<sub>th</sub>, including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph (b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P<sub>i</sub> = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

P<sub>th,i</sub> = the exemption threshold power (P<sub>th</sub>) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

ERP<sub>j</sub> = the ERP of fixed, mobile, or portable RF source j.

ERP<sub>th,j</sub> = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π according to the applicable formula of paragraph (b)(3)(i)(C) of this section.

Evaluated<sub>k</sub> = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

Exposure Limit<sub>k</sub> = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from §1.1310 of this chapter.

## RF Exposure evaluation

Limits for Maximum Permissible Exposure (MPE) for RF sources are defined in FCC 47 CFR “§1.1310 Radiation Exposure limits, paragraph (e)”:

**TABLE 1 to §1.1310(e)(1)—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(i) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
<b>(ii) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. \* = Plane-wave equivalent power density.

Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction:

$$\text{Power density: } S[\text{mW} / \text{cm}^2] = \frac{P_{E.I.R.P.}[\text{mW}]}{4\pi R[\text{cm}]^2}$$

Where:

$S$  = power density

$P_{E.I.R.P.}$  = Equivalent isotropically radiated power

$R$  = distance to the center of radiation of the antenna (evaluation distance)

$$P_{E.I.R.P.} = P_T + G_T - L_C$$

Where:

$P_T$  = transmitter output power (including tune-up tolerance)

$G_T$  = gain of the transmitting antenna

$L_C$  = signal attenuation in the connecting cable between the transmitter and the antenna if applicable

### **Simultaneous transmission assessment:**

When multiple sources are introduced into an environment, it becomes necessary to address the sources interdependently, since each source will contribute some percentage of the maximum exposure toward the total exposure. The sum of the ratios of the exposure from each source to the corresponding maximum exposure for the frequency of each source must be evaluated.

The exposure complies with the maximum permissible exposure if the sum of the ratios is less than unity:

$$\sum_{i=1}^n \frac{S_i}{Lim_i}$$

Where:

$S_i$  is the applicable contribution of each source (e.g. power flux density).

$Lim_i$  is the limit for the applicable contribution of each source (e.g. MPE power flux density basic restriction).