

Test report No:
 3830ERM.005

Assessment report

RF EXPOSURE REPORT ACCORDING TO FCC 47 CFR Part 2.1093 FCC 47 CFR Part 1.1307

(*) Identification of item under evaluation	Infotainment Head Unit
(*) Trademark	Garmin
(*) Model and /or type reference	MGU22
(*) Other identification of the product	FCC ID: IPH-03910
(*) Features	USB2.0 (3 ports), HS-CAN, 100BaseT1(OABR), 1000BaseT1(GBit), Bluetooth, WLAN 802.11ax,u MIMO (2.4GHz/5GHz), APIX2 & APIX3 display link (HDCP2.3), FPD-Link III, GNSS
(*) Manufacturer	Garmin International, Inc. 1200 E. 151st Street Olathe, Kansas 66062, USA.
Test method requested, standard	FCC 47 CFR Part 2.1093. Radiofrequency radiation exposure evaluation: portable devices. FCC 47 CFR Part 1.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	03-30-2023
Report template No	FAN24_02 (*) "Data provided by the client"

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Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item under evaluation", "Trademark", "Model and/or type reference", "General description of the device", "Other identification of the product").
2. Maximum antenna gain and use distance information.

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

Identification of the client

Garmin International, Inc.
1200 E. 151st Street,
Olathe, Kansas 66062, USA

Document history

Report number	Date	Description
3830ERM.005	03-30-2023	First release

Appendix A: FCC RF Exposure assessment result

General description of the device under evaluation

The device under evaluation consists of an Automotive Infotainment Head Unit.

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 distance ($\geq 5\text{cm}$). In order to perform the assessment a conservative evaluation distance of (5 cm) has been used.

As stated into DEKRA Certification Inc. test report num. 3154ERM.009, 3154ERM.010, and 3830ERM.002 the maximum measured output power levels for each supported technology are:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Maximum Conducted Output Power (dBm)	Antenna peak gain (dBi)	Maximum E.R.P. (dBm)	Maximum E.R.P. (mW)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (mW)
802.11b/g/n/ax	2.4 GHz	2412 - 2484	17.20	-2.50	12.55	17.99	14.70	29.51
802.11a/n/ac/ax	U-NII-1	5150 - 5250	18.19	-2.80	13.24	21.09	15.39	34.59
802.11a/n/ac/ax	U-NII-2A	5260 - 5320	15.70	-2.80	10.75	11.89	12.90	19.50
802.11a/n/ac/ax	U-NII-2C	5500 - 5700	13.00	-2.80	8.05	6.38	10.20	10.47
802.11a/n/ac/ax	U-NII-3	5725 - 5850	14.32	-2.80	9.37	8.65	11.52	14.19
Bluetooth BR/EDR	2.4 GHz	2400 - 2483.5	5.50	-2.50	0.85	1.22	3.00	2.00
BTLE	2.4 GHz	2400 - 2483.5	0.20	-2.50	-4.45	0.36	-2.30	0.59

Table 1: Equipment specifications

Evaluation Results

Determination of Exemption according to FCC 47 CFR Part 1.1307:

The evaluation according to the minimum intended use distance of 5cm will be as follow:

Technology / Mode	Operating Band	Frequency under evaluation (MHz)	Distance (cm)	Maximum E.R.P. (mW)	§1.1307(b)(3).i.(C) Exposure Limit (mW)	Verdict
802.11b/g/n/ax	2.4 GHz	2412 - 2484	5.00	17.99	48.00	Pass
802.11a/n/ac/ax	U-NII-1	5150 - 5250	5.00	21.09	48.00	Pass
802.11a/n/ac/ax	U-NII-2A	5260 - 5320	5.00	11.89	48.00	Pass
802.11a/n/ac/ax	U-NII-2C	5500 - 5700	5.00	6.38	48.00	Pass
802.11a/n/ac/ax	U-NII-3	5725 - 5850	5.00	8.65	48.00	Pass
Bluetooth BR/EDR	2.4 GHz	2400 - 2483.5	5.00	1.22	48.00	Pass
BTLE	2.4 GHz	2400 - 2483.5	5.00	0.36	48.00	Pass

Table 2: FCC Exemption Evaluation Result

The computed value(s) are below the exemption 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 using Bluetooth, Wi-Fi 2.4 GHz and Wi-Fi 5GHz transmitters, therefore the most conservative approach for the evaluation of the simultaneous transmission will be:

Simultaneous technologies and modes	Result (\sum of Pout/Pmax ratios)	Verdict ($\sum \leq 1$)
802.11b/g/n/ax (UL MIMO) 2.4 GHz + Bluetooth BR/EDR 2.4 GHz	0.40	Pass
802.11a/n/ac/ax (UL MIMO) U-NII-1 + Bluetooth BR/EDR 2.4 GHz	0.46	Pass

Table 3: Simultaneous Result

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_{th} (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_{th} 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 λ 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_{th}, 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_i = 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_{th,i} = the exemption threshold power (P_{th}) according to paragraph (b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.

ERP_j = the ERP of fixed, mobile, or portable RF source j.

ERP_{th,j} = 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_k = 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_k = 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.