



# Radio Frequency Exposure Evaluation Report

**FOR:**

Garmin International, Inc.

**Model Name:**

GMN-02245

**Product Description:**

LTE/Wi-Fi Datalink and Data Storage System

**FCC ID:** IPH-03788

**IC ID:** 1792A-03788

**Per:**

CFR Part Part1 (1.1307 & 1.1310), Part 2 (2.1091),  
FCC KDB 447498 D01 General RF Exposure Guidance v06  
ISED RSS-102 Issue 5

**Report number:** EMC\_GARMI-103-22001\_FCC\_MPE

**DATE:** 2022-03-22



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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 Name
Garmin International, Inc	LTE/Wi-Fi Datalink and Data Storage System	GMN-02245

### Report reviewed by: TCB Evaluator

2022-03-22	Compliance	Kevin Wang (EMC Lab Manager)	
Date	Section	Name	Signature

### Responsible for the Report:

2022-03-22	Compliance	Cheng Song (EMC Engineer)	
Date	Section	Name	Signature

## 2 Administrative Data

### 2.1 Identification of the Testing Laboratory Issuing the Test Report

<b>Company Name:</b>	CETECOM Inc.
<b>Department:</b>	Compliance
<b>Street Address:</b>	411 Dixon Landing Road
<b>City/Zip Code</b>	Milpitas, CA 95035
<b>Country</b>	USA
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<b>Lab Manager:</b>	Kevin Wang
<b>Responsible Project Leader:</b>	Sangeetha Sivaraman

### 2.2 Identification of the Client / Manufacturer

<b>Client's Name:</b>	Garmin International, Inc.
<b>Street Address:</b>	1200 East 151st Street
<b>City/Zip Code</b>	Olathe, KS / 66062
<b>Country</b>	USA

### Identification of the Manufacturer

<b>Manufacturer's Name:</b>	Same as Client
<b>Manufacturers Address:</b>	
<b>City/Zip Code</b>	
<b>Country</b>	

### 3 Equipment under Assessment

<b>Model Name:</b>	GMN-02245
<b>Marketing Name:</b>	GDL 60
<b>HW Version :</b>	Ver B
<b>SW Version :</b>	2.10
<b>FCC-ID :</b>	IPH-03788
<b>IC-ID:</b>	1792A-03788
<b>HVIN:</b>	GMN-02245
<b>PMN:</b>	GDL 60
<b>Regulatory Band:</b>	<ul style="list-style-type: none"> <li>❖ <b><u>Cellular Module:</u></b> <ul style="list-style-type: none"> <li>▪ WCDMA/UMTS FDD BAND II: 1852.4 ~ 1907.6 MHz</li> <li>▪ WCDMA/UMTS FDD BAND IV: 1712.4 ~ 1752.6 MHz</li> <li>▪ WCDMA/UMTS FDD BAND V: 826.4 ~ 846.6 MHz</li> <li>▪ LTE BAND 2: 1857.5 ~ 1902.5 MHz</li> <li>▪ LTE BAND 4: 1717.5 ~ 1747.5 MHz</li> <li>▪ LTE BAND 5: 824.7 ~ 848.3 MHz</li> <li>▪ LTE BAND 7:2510 ~ 2560 MHz</li> <li>▪ LTE BAND 12: 699.7 ~ 715.3 MHz</li> <li>▪ LTE BAND 25: 1850 ~ 1915 MHz</li> <li>▪ LTE BAND 26: 814 ~ 849 MHz</li> <li>▪ LTE BAND 38: 2570 ~2620 MHz</li> <li>▪ LTE BAND 41: 2496 ~ 2690 MHz</li> </ul> </li> <li>❖ <b><u>WLAN:</u></b> <ul style="list-style-type: none"> <li>▪ Nominal band: 2400 MHz – 2483.5 MHz;</li> <li>▪ Center to center: 2412 MHz (ch 1) – 2462 MHz (ch 11), 11 channels</li> </ul> </li> </ul>
<b>Integrated Module Info:</b>	<ul style="list-style-type: none"> <li>❖ <b><u>Cellular Module:</u></b> <ul style="list-style-type: none"> <li>▪ Module name: Quectel</li> <li>▪ Model number: EG25-G</li> <li>▪ FCC/IC ID: QIPPLS62-W / 7830A-PLS62W</li> </ul> </li> <li>❖ <b><u>WLAN:</u></b> <ul style="list-style-type: none"> <li>▪ Manufacture: Texas Instruments</li> <li>▪ Module name/number: WiLink WL1807MOD</li> <li>▪ FCC ID: Z64-WL18DBMOD</li> <li>▪ IC ID: 451I-WL18DBMOD</li> </ul> </li> <li>❖ <b><u>WLAN,BT,BLE:</u></b> <ul style="list-style-type: none"> <li>▪ Module Name: Texas Instruments</li> <li>▪ Module Number: WiLink WL1837MOD</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>▪ FCC ID: Z64-WL18DBMOD</li> <li>▪ IC ID: 451I-WL18DBMOD</li> </ul>
<b>Antenna Type:</b>	<ul style="list-style-type: none"> <li>❖ <b><u>Cellular: refer to table below</u></b></li> <li>❖ <b><u>WLAN, BLE, BT:</u></b> <ul style="list-style-type: none"> <li>▪ Antenna gain: 5 dBi</li> </ul> </li> </ul>
<b>Maximum Conducted Output Power:</b>	<ul style="list-style-type: none"> <li>❖ <b><u>Cellular:</u></b> From conducted test report [Watts]:                         <ul style="list-style-type: none"> <li>▪ WCDMA Band II: 0.316</li> <li>▪ WCDMA Band IV: 0.316</li> <li>▪ WCDMA Band V: 0.316</li> <li>▪ LTE Band 2: 0.316</li> <li>▪ LTE Band 4: 0.316</li> <li>▪ LTE Band 5: 0.316</li> <li>▪ LTE Band 7: 0.316</li> <li>▪ LTE Band 12: 0.316</li> <li>▪ LTE Band 25: 0.316</li> <li>▪ LTE Band 26: 0.316</li> <li>▪ LTE Band 38: 0.316</li> <li>▪ LTE Band 41: 0.316</li> </ul> </li> <li>❖ <b><u>WLAN1:</u></b> From modular grant [Watts]: 0.2438</li> <li>❖ <b><u>WLAN2:</u></b> From modular grant [Watts]: 0.2438</li> <li>❖ <b><u>BT:</u></b> From modular grant [Watts]: 0.015</li> <li>❖ <b><u>BLE:</u></b> From modular grant [Watts]: 0.005</li> </ul>
<b>Power Supply/ Rated Operating Voltage Range:</b>	Vmin: 9 VDC/ Vnom: 24 VDC / Vmax: 32 VDC
<b>Operating Temperature Range:</b>	-40°C to 70 °C
<b>Sample Revision:</b>	<input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production

LTE Band	Frequency Range (MHz)	GA 60 Peak Gain	GA 61 Peak Gain
1	1920-1980	2.1	3.4
2	1850-1910	1.7	2.4
3	1710-1785	1.6	0.6
4	1710-1755	1.6	0.6
5	824-849	0.4	0.2
7	2500-2570	5.4	4.5
8	880-915	0.8	0.3
12	699-715	0.3	0.5
13 (Disabled)	777-787	0.9	0.9
18	815-830	0.1	0.2
19	830-845	0.4	0.2
20	832-862	0.4	0.8
25	1850-1915	1.7	2.4
26	814-849	0.4	0.2
28	703-748	0.3	0.9
38	2570-2620	5.4	4.5
39	1880-1920	1.3	2.4
40	2300-2400	3.4	4.7
41	2496-2690	5.4	4.5
UMTS Band	Frequency Range (MHz)	GA 60 Peak Gain	GA 61 Peak Gain
1	1920-1980	2.1	3.4
2	1850-1910	1.7	2.4
4	1710-1755	1.6	0.6
5	824-849	0.4	0.2
8	880-915	0.8	0.3

#### 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 <sup>2</sup> )	Averaging time (minutes)
300 – 1500	f (MHz) /1500	30
1500 – 100000	1.0	30

IC

300 – 6000	0.02619 x f (MHz) <sup>0.6834</sup>	6
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##### 4.2 Routine Environmental Evaluation Categorical Exclusion Limits acc. to FCC 2.1091(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 dBm);  
 operating frequency > 1.5GHz: excluded if ERP < 3.0W / 34.8dBm (EIRP: 36.9 dBm);

IC

300MHz <= operating frequency < 6 GHz: excluded if EIRP < 0.0131 x f (MHz)<sup>0.6834</sup> 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/cm<sup>2</sup> or W/m<sup>2</sup>)  
 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 of RF Exposure for simultaneous transmission

- Evaluations are based on worst case power density limits for Canada.
- Calculations are made for 20cm.
- Evaluations are based on ERP/EIRP measured or calculated from known gain and conducted output power.
- Cellular can transmit simultaneously with WLAN, BT or BLE.

#### Antenna GA60:

Radio	freq MHz	MaxPower W conducted from module grant	MaxPower from module grant convert to dBm	Ant Gain dbi	Ant Gain lin	EIRP W calculated	Canada W/m2	US W/m2	Actual W/m2	How much of IC limit is used up	How much of FCC limit is used up
WCDMA II	1850	0.316	25.000	1.7	1.48	0.468	4.476	10.000	0.931	20.78%	2.07%
WCDMA IV	1710	0.316	25.000	1.6	1.45	0.457	4.242	10.000	0.909	21.43%	2.14%
WCDMA V	824	0.316	25.000	0.4	1.10	0.347	2.576	5.493	0.690	26.76%	4.86%
LTE 2	1850	0.316	25.000	1.7	1.48	0.468	4.476	10.000	0.931	20.78%	2.07%
LTE 4	1710	0.316	25.000	1.6	1.45	0.457	4.242	10.000	0.909	21.43%	2.14%
LTE 5	824	0.316	25.000	0.4	1.10	0.347	2.576	5.493	0.690	26.76%	4.86%
LTE 7	2500	0.316	25.000	5.4	3.47	1.096	5.499	10.000	2.181	39.66%	3.96%
LTE 12	699	0.316	25.000	0.3	1.07	0.339	2.302	4.660	0.674	29.29%	6.27%
LTE 25	1850	0.316	25.000	1.7	1.48	0.468	4.476	10.000	0.931	20.78%	2.07%
LTE 26	814	0.316	25.000	0.4	1.10	0.347	2.554	5.427	0.690	26.98%	4.96%
LTE 38	2570	0.316	25.000	5.4	3.47	1.096	5.604	10.000	2.180	38.89%	3.88%
LTE 41	2496	0.316	25.000	5.4	3.47	1.096	5.493	10.000	2.181	39.71%	3.97%
								Distance(m)=	0.200		
BT	2402	0.015	11.644	5	3.16	0.046	5.351	10.000	0.092	1.70%	0.17%
BT-LE	2402	0.005	6.902	5	3.16	0.015	5.351	10.000	0.031	0.56%	0.05%
WLAN	2400	0.244	23.870	5	3.16	0.771	5.348	10.000	1.534	28.67%	2.86%

Note: The calculation is based on the distance of 20cm



**Antenna GA61:**

Radio	freq MHz	MaxPower W conducted from module grant	MaxPower from module grant convert to dBm	Ant Gain dbi	Ant Gain lin	EIRP W calculated	Canda W/m2	US W/m2	Actual W/m2	How much of IC limit is used up	How much of FCC limit is used up
WCDMA II	1850	0.316	25.000	2.4	1.74	0.550	4.476	10.000	1.093	24.42%	2.44%
WCDMA IV	1710	0.316	25.000	0.6	1.15	0.363	4.242	10.000	0.722	17.02%	1.70%
WCDMA V	824	0.316	25.000	0.2	1.05	0.331	2.576	5.493	0.659	25.55%	4.64%
LTE 2	1850	0.316	25.000	2.4	1.74	0.550	4.476	10.000	1.093	24.42%	2.44%
LTE 4	1710	0.316	25.000	0.6	1.15	0.363	4.242	10.000	0.722	17.02%	1.70%
LTE 5	824	0.316	25.000	0.2	1.05	0.331	2.576	5.493	0.659	25.55%	4.64%
LTE 7	2500	0.316	25.000	4.5	2.82	0.891	5.499	10.000	1.773	32.24%	3.22%
LTE 12	699	0.316	25.000	0.5	1.12	0.355	2.302	4.660	0.706	30.64%	6.57%
LTE 25	1850	0.316	25.000	2.4	1.74	0.550	4.476	10.000	1.093	24.42%	2.44%
LTE 26	814	0.316	25.000	0.2	1.05	0.331	2.554	5.427	0.659	25.76%	4.74%
LTE 38	2570	0.316	25.000	4.5	2.82	0.891	5.604	10.000	1.772	31.61%	3.16%
LTE 41	2496	0.316	25.000	4.5	2.82	0.891	5.493	10.000	1.773	32.28%	3.22%
								Distance(m)=	0.200		
BT	2402	0.015	11.644	5	3.16	0.046	5.351	10.000	0.092	1.70%	0.17%
BT-LE	2402	0.005	6.902	5	3.16	0.015	5.351	10.000	0.031	0.56%	0.05%
WLAN	2400	0.244	23.870	5	3.16	0.771	5.348	10.000	1.534	28.67%	2.86%

**Note : The calculation is based on the distance of 20cm**

## 5.2 Conclusion:

The worst-case simultaneous transmission is LTE 41 simultaneous with 2 x WLAN using Antenna GA60, which is using 97.05% of a limit of 100%. The equipment is passing RF exposure requirements for 20cm distance.

## 6 Revision History

Date	Report Name	Changes to report	Report prepared by
2022-03-22	EMC_GARMI-103-22001_FCC_MPE	Initial Version	Cheng Song

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