



# 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-094-21001\_FCC\_ISED\_MPE\_R1

**DATE:** 2021-11-12



**CETECOM Inc.**

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CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

## 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.

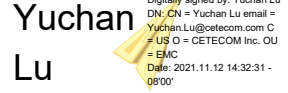
| Company                   | Description                                | Model Name |
|---------------------------|--------------------------------------------|------------|
| Garmin International, Inc | LTE/Wi-Fi Datalink and Data Storage System | GMN-02245  |

### Report reviewed by: TCB Evaluator

|            |            |                             |                                                                                                                        |
|------------|------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------|
| 2021-11-12 | Compliance | Kevin Wang<br>(Lab Manager) | Kevin Wang<br>wang@cetecom.com<br> |
|------------|------------|-----------------------------|------------------------------------------------------------------------------------------------------------------------|

| Date | Section | Name | Signature |
|------|---------|------|-----------|
|------|---------|------|-----------|

### Responsible for the Report:

|            |            |                              |                                                                                                    |
|------------|------------|------------------------------|----------------------------------------------------------------------------------------------------|
| 2021-11-12 | Compliance | Yuchan Lu<br>(Test Engineer) | Yuchan Lu<br> |
|------------|------------|------------------------------|----------------------------------------------------------------------------------------------------|

| 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                    |
| <b>Telephone:</b>                  | +1 (408) 586 6200      |
| <b>Fax:</b>                        | +1 (408) 586 6299      |
| <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 11                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>SW Version :</b>            | 1.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>FCC-ID :</b>                | IPH-03788                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>IC-ID:</b>                  | 1792A-03788                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>FWIN:</b>                   | 1.40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>HVIN:</b>                   | GMN-02245                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>PMN:</b>                    | GDL 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Regulatory Band:</b>        | <p>❖ <b><u>Cellular Module:</u></b></p> <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> <p>❖ <b><u>WLAN:</u></b></p> <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> |
| <b>Integrated Module Info:</b> | <p>❖ <b><u>Cellular Module:</u></b></p> <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> <p>❖ <b><u>WLAN:</u></b></p> <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> <p>❖ <b><u>WLAN,BT,BLE:</u></b></p> <ul style="list-style-type: none"> <li>▪ Module Name: Texas Instruments</li> </ul>                                                                                                                                                                                                                                                                           |

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                              | <ul style="list-style-type: none"> <li>Module Number: WiLink WL1835MOD</li> <li>FCC ID: Z64-WL18SBMOD</li> <li>IC ID: 451I-WL18SBMOD</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Antenna Type:                                | <ul style="list-style-type: none"> <li>❖ <u>Cellular: refer to table below</u></li> <li>❖ <u>WLAN,BLE,BT:</u> <ul style="list-style-type: none"> <li>Antenna gain: 5 dBi</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Maximum Conducted Output Power:              | <ul style="list-style-type: none"> <li>❖ <u>Cellular:</u>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>❖ <u>WLAN1:</u> From modular grant [Watts]: 0.2438</li> <li>❖ <u>WLAN2:</u> From modular grant [Watts]: 0.2438</li> <li>❖ <u>BT:</u> From modular grant [Watts]: 0.0173</li> <li>❖ <u>BLE:</u> From modular grant [Watts]: 0.01</li> </ul> |
| Power Supply/ Rated Operating Voltage Range: | Vmin: 9 VDC/ Vnom: 24 VDC / Vmax: 32 VDC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Operating Temperature Range:                 | -40°C to 70 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Sample Revision:                             | <input type="checkbox"/> Prototype Unit; <input type="checkbox"/> Production Unit; <input checked="" type="checkbox"/> Pre-Production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| LTE Band      | Frequency Range | 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 | 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 | $0.02619 \times f \text{ (MHz)}^{0.6834}$ | 6 |
|------------|-------------------------------------------|---|

##### 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 <  $0.0131 \times f \text{ (MHz)}^{0.6834} \text{ W}$

##### 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] | Max Conducted power [W] | Gain [dBi] | Gain [lin] | EIRP [W] | IC Limit [W/m <sup>2</sup> ] | FCC Limit [W/m <sup>2</sup> ] | Actual [W/m <sup>2</sup> ] <sup>2</sup> | How much of IC limit is used up | How much of FCC limit is used up |
|----------|------------|-------------------------|------------|------------|----------|------------------------------|-------------------------------|-----------------------------------------|---------------------------------|----------------------------------|
| WCDMA II | 1850       | 0.316                   | 1.7        | 1.48       | 0.468    | 4.476                        | 10.000                        | 0.931                                   | 20.78%                          | 2.07%                            |
| WCDMA IV | 1710       | 0.316                   | 1.6        | 1.45       | 0.457    | 4.242                        | 10.000                        | 0.909                                   | 21.43%                          | 2.14%                            |
| WCDMA V  | 824        | 0.316                   | 0.4        | 1.10       | 0.347    | 2.576                        | 5.493                         | 0.690                                   | 26.76%                          | 4.86%                            |
| LTE 2    | 1850       | 0.316                   | 1.7        | 1.48       | 0.468    | 4.476                        | 10.000                        | 0.931                                   | 20.78%                          | 2.07%                            |
| LTE 4    | 1710       | 0.316                   | 1.6        | 1.45       | 0.457    | 4.242                        | 10.000                        | 0.909                                   | 21.43%                          | 2.14%                            |
| LTE 5    | 824        | 0.316                   | 0.4        | 1.10       | 0.347    | 2.576                        | 5.493                         | 0.690                                   | 26.76%                          | 4.86%                            |
| LTE 7    | 2500       | 0.316                   | 5.4        | 3.47       | 1.096    | 5.499                        | 10.000                        | 2.181                                   | 39.66%                          | 3.96%                            |
| LTE 12   | 699        | 0.316                   | 0.3        | 1.07       | 0.339    | 2.302                        | 4.660                         | 0.674                                   | 29.29%                          | 6.27%                            |
| LTE 25   | 1850       | 0.316                   | 1.7        | 1.48       | 0.468    | 4.476                        | 10.000                        | 0.931                                   | 20.78%                          | 2.07%                            |
| LTE 26   | 814        | 0.316                   | 0.4        | 1.10       | 0.347    | 2.554                        | 5.427                         | 0.690                                   | 26.98%                          | 4.96%                            |
| LTE 38   | 2570       | 0.316                   | 5.4        | 3.47       | 1.096    | 5.604                        | 10.000                        | 2.180                                   | 38.89%                          | 3.88%                            |
| LTE 41   | 2496       | 0.316                   | 5.4        | 3.47       | 1.096    | 5.493                        | 10.000                        | 2.181                                   | 39.71%                          | 3.97%                            |
|          |            |                         |            |            |          |                              |                               |                                         |                                 |                                  |
| WLAN1    | 2400       | 0.244                   | 5          | 3.16       | 0.771    | 5.348                        | 10.000                        | 1.534                                   | 28.67%                          | 0.20%                            |
| WLAN2    | 2400       | 0.244                   | 5          | 3.16       | 0.771    | 5.348                        | 10.000                        | 1.534                                   | 28.67%                          | 0.20%                            |
| BT       | 2402       | 0.017                   | 5          | 3.16       | 0.055    | 5.351                        | 10.000                        | 0.109                                   | 2.02%                           | 0.11%                            |
| BT-LE    | 2402       | 0.010                   | 5          | 3.16       | 0.032    | 5.351                        | 10.000                        | 0.063                                   | 1.16%                           | 2.86%                            |

Note1: The calculation is based on the distance of 20cm

### Antenna GA61:

| Radio    | Freq [MHz] | Max Conducted power [W] | Gain [dBi] | Gain [lin] | EIRP [W] | IC Limit [W/m2] | FCC Limit [W/m2] | Actual [W/m2] <sup>2</sup> | How much of IC limit is used up | How much of FCC limit is used up |
|----------|------------|-------------------------|------------|------------|----------|-----------------|------------------|----------------------------|---------------------------------|----------------------------------|
| WCDMA II | 1850       | 0.316                   | 2.4        | 1.74       | 0.550    | 4.476           | 10.000           | 1.093                      | 24.42%                          | 2.44%                            |
| WCDMA IV | 1710       | 0.316                   | 0.6        | 1.15       | 0.363    | 4.242           | 10.000           | 0.722                      | 17.02%                          | 1.70%                            |
| WCDMA V  | 824        | 0.316                   | 0.2        | 1.05       | 0.331    | 2.576           | 5.493            | 0.659                      | 25.55%                          | 4.64%                            |
| LTE 2    | 1850       | 0.316                   | 2.4        | 1.74       | 0.550    | 4.476           | 10.000           | 1.093                      | 24.42%                          | 2.44%                            |
| LTE 4    | 1710       | 0.316                   | 0.6        | 1.15       | 0.363    | 4.242           | 10.000           | 0.722                      | 17.02%                          | 1.70%                            |
| LTE 5    | 824        | 0.316                   | 0.2        | 1.05       | 0.331    | 2.576           | 5.493            | 0.659                      | 25.55%                          | 4.64%                            |
| LTE 7    | 2500       | 0.316                   | 4.5        | 2.82       | 0.891    | 5.499           | 10.000           | 1.773                      | 32.24%                          | 3.22%                            |
| LTE 12   | 699        | 0.316                   | 0.5        | 1.12       | 0.355    | 2.302           | 4.660            | 0.706                      | 30.64%                          | 6.57%                            |
| LTE 25   | 1850       | 0.316                   | 2.4        | 1.74       | 0.550    | 4.476           | 10.000           | 1.093                      | 24.42%                          | 2.44%                            |
| LTE 26   | 814        | 0.316                   | 0.2        | 1.05       | 0.331    | 2.554           | 5.427            | 0.659                      | 25.76%                          | 4.74%                            |
| LTE 38   | 2570       | 0.316                   | 4.5        | 2.82       | 0.891    | 5.604           | 10.000           | 1.772                      | 31.61%                          | 3.16%                            |
| LTE 41   | 2496       | 0.316                   | 4.5        | 2.82       | 0.891    | 5.493           | 10.000           | 1.773                      | 32.28%                          | 3.22%                            |
|          |            |                         |            |            |          |                 |                  |                            |                                 |                                  |
| WLAN1    | 2400       | 0.244                   | 5          | 3.16       | 0.771    | 5.348           | 10.000           | 1.534                      | 28.67%                          | 0.20%                            |
| WLAN2    | 2400       | 0.244                   | 5          | 3.16       | 0.771    | 5.348           | 10.000           | 1.534                      | 28.67%                          | 0.20%                            |
| BT       | 2402       | 0.017                   | 5          | 3.16       | 0.055    | 5.351           | 10.000           | 0.109                      | 2.02%                           | 0.11%                            |
| BT-LE    | 2402       | 0.010                   | 5          | 3.16       | 0.032    | 5.351           | 10.000           | 0.063                      | 1.16%                           | 2.86%                            |

## 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 |
|------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 2021-10-22 | EMC_GARMI-094-21001_FCC_ISED_MPE    | Initial Version                                                                                                                    | Yuchan Lu          |
| 2021-11-12 | EMC_GARMI-094-21001_FCC_ISED_MPE_R1 | Deleted LTE Band 13 and added LTE Band 38. Added the Bands' data of antenna GA61 has higher antenna gain. Added FCC limit used up. | Yuchan Lu          |

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