



## **MPE/RF EXPOSURE EVALUATION REPORT**

**FCC CFR 47 Part 1.1310**

**Report No.: DIGI114-U1A Rev A**

**Company:** Digi International Inc.

**Model Name:** HXGW900

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**Model Name:** HXGW900

**To:** FCC CFR 47 Part 1.1310

**Test Report Serial No.:** DIGI114-U1A Rev A

This report supersedes: NONE

**Applicant:** Digi International Inc.  
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**Issue Date:** 6th June 2024

### **This Test Report is Issued Under the Authority of:**

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## 1. MAXIMUM PERMISSABLE EXPOSURE

### Calculations for Maximum Permissible Exposure Levels

$$\text{Power Density} = P_d (\text{mW/cm}^2) = \text{EIRP} / (4 * \pi * d^2)$$

$$\text{EIRP} = P * G$$

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

$$\text{Numeric Gain} = 10^{(G (\text{dBi})/10)}$$

The calculations in the table below use the highest conducted power values together with the highest antenna gain specified for the EUT. These calculations represent worst case in terms of the exposure levels.

The 2 radio modules used by Digi were assessed for compliance to RF exposure requirements of FCC CFR 47 Part 1.1310.

1) LoRa radio manufactured by Digi International Inc. Model HXGW900 FCC ID: 2ANQY-HXGW900.

2) Quectel Wireless LTE module model EC21-A, EC21-A MINIPCIE . Radio conducted output power for each band used in this evaluation was taken from TA Technology Co., Ltd report R1805A0226-M5V1 Dated June 11, 2018.

These calculations represent worst case in terms of the exposure levels

| Band          | Freq (MHz) | Ant Gain (dBi) | Numeric Gain (numeric) | Peak Output Power (dBm) | Peak Output Power (mW) | Calculated Power Density (mW/cm <sup>2</sup> ) @ 20cm | Power Density Limit (mW/cm <sup>2</sup> ) | Min Calculated safe distance for Limit (cm) | RATIO Power Density/ Limit |
|---------------|------------|----------------|------------------------|-------------------------|------------------------|-------------------------------------------------------|-------------------------------------------|---------------------------------------------|----------------------------|
| WCDMA Band II | 1850.0     | 4.00           | 2.51                   | 23.5                    | 223.87                 | 0.112                                                 | 1.00                                      | 6.69                                        | 0.112                      |
| WCDMA Band IV | 1710.0     | 4.00           | 2.51                   | 23.5                    | 223.87                 | 0.112                                                 | 1.00                                      | 6.69                                        | 0.112                      |
| WCDMA Band V  | 824.0      | 4.00           | 2.51                   | 23.5                    | 223.87                 | 0.112                                                 | 0.55                                      | 9.03                                        | 0.204                      |
| LTE Band 2    | 1850.0     | 4.00           | 2.51                   | 23.5                    | 223.87                 | 0.112                                                 | 1.00                                      | 6.69                                        | 0.112                      |
| LTE Band 4    | 1710.0     | 4.00           | 2.51                   | 23.5                    | 223.87                 | 0.112                                                 | 1.00                                      | 6.69                                        | 0.112                      |
| LTE Band 12   | 699.0      | 4.00           | 2.51                   | 23.5                    | 223.87                 | 0.112                                                 | 0.47                                      | 9.80                                        | 0.240                      |
| 902 – 928 MHz | 902.0      | 4.00           | 2.51                   | 26.1                    | 407.38                 | 0.204                                                 | 0.60                                      | 11.64                                       | 0.339                      |

### Worst Case Simultaneous Operation – assessment for safe distance of 20cm

These calculations represent worst case in terms of the exposure levels and assume all radio transmitters i.e. the LTE Cellular and 900 MHz LoRa radios are both active and operating simultaneously.

| Band                                                                     | Freq (MHz) | Ant Gain (dBi) | Numeric Gain (numeric) | Peak Output Power (dBm) | Peak Output Power (mW) | Calculated Power Density (mW/cm <sup>2</sup> ) @ 20cm | Power Density Limit (mW/cm <sup>2</sup> ) | Min Calculated safe distance for Limit (cm) | RATIO Power Density/ Limit |
|--------------------------------------------------------------------------|------------|----------------|------------------------|-------------------------|------------------------|-------------------------------------------------------|-------------------------------------------|---------------------------------------------|----------------------------|
| LTE Band 12                                                              | 699.0      | 4.00           | 2.51                   | 23.5                    | 223.87                 | 0.112                                                 | 0.47                                      | 9.80                                        | 0.240                      |
| 902 – 928 MHz                                                            | 902.0      | 4.00           | 2.51                   | 26.1                    | 407.38                 | 0.204                                                 | 0.60                                      | 11.64                                       | 0.339                      |
| <b>Summation Pd<sub>Calc</sub>/ Pd<sub>Limit</sub> @ 20 cm distance:</b> |            |                |                        |                         |                        |                                                       |                                           |                                             | <b>0.579</b>               |

Evaluation for compliance of simultaneous transmission where the power density limits are different is performed by the summation of ratios;

### Calculated Power Density/Power Density Limit

$$Pd_{\text{Calc1}}/Pd_{\text{Limit1}} + Pd_{\text{Calc2}}/Pd_{\text{Limit2}} < 1.$$

Note: for mobile or fixed location transmitters the minimum separation distance is 20cm, even if calculations indicate the MPE distance to be less.

**SUMMARY;** Minimum safe distance to meet the RF exposure requirements = 20cm

### Specification - Maximum Permissible Exposure Limits

The Limits are defined in Table 1 of FCC §1.1310.

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>(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                      |



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