

# Maximum Permissible Exposure

**Equipment** : Industrial 2.4G 802.11n/ 5G 802.11ac  
Wave1 mPCIe module

**Brand Name** : Korenix

**Model No.** : Industrial 2.4G 802.11n/ 5G 802.11ac  
Wave1 mPCIe module

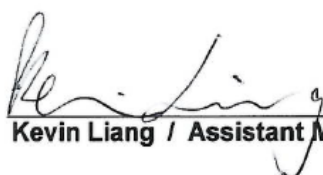
**FCC ID** : SSA-JW1223

**Standard** : IEEE C95.1

**Applicant** : Korenix Technology Co., Ltd.  
**Manufacturer** : 14F., No.213,Sec. 3,Beixin Rd., Xindian Dist.,  
New Taipei City 23143, | Taiwan (R.O.C)

The product sample received on Apr. 18, 2016 and completely tested on Jun. 16, 2016. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in IEEE C95.1 and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

  
Kevin Liang / Assistant Manager



## **Table of Contents**

|            |                                           |          |
|------------|-------------------------------------------|----------|
| <b>1</b>   | <b>HUMAN EXPOSURE ASSESSMENT .....</b>    | <b>4</b> |
| <b>1.1</b> | <b>Maximum Permissible Exposure .....</b> | <b>4</b> |

## Revision History

[illegible]

# 1 Human Exposure Assessment

## 1.1 Maximum Permissible Exposure

### 1.1.1 Limit of Maximum Permissible Exposure

| Limits for Occupational / Controlled Exposure                       |                                   |                                   |                                          |                                                                  |
|---------------------------------------------------------------------|-----------------------------------|-----------------------------------|------------------------------------------|------------------------------------------------------------------|
| Frequency Range (MHz)                                               | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
| 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                                                                |
| 300-1500                                                            | -                                 | -                                 | F/300                                    | 6                                                                |
| 1500-100,000                                                        | -                                 | -                                 | 5                                        | 6                                                                |
| Limits for General Population / Uncontrolled Exposure               |                                   |                                   |                                          |                                                                  |
| Frequency Range (MHz)                                               | Electric Field Strength (E) (V/m) | Magnetic Field Strength (H) (A/m) | Power Density (S) (mW/ cm <sup>2</sup> ) | Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes) |
| 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                                                               |
| 300-1500                                                            | -                                 | -                                 | F/1500                                   | 30                                                               |
| 1500-100,000                                                        | -                                 | -                                 | 1.0                                      | 30                                                               |
| Note 1: f = frequency in MHz ; *Plane-wave equivalent power density |                                   |                                   |                                          |                                                                  |
| Note 2: For the applicable limit, see FCC 1.1310                    |                                   |                                   |                                          |                                                                  |

### 1.1.2 MPE Calculation Method

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW)

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 (appropriate units, e.g., cm)

**1.1.3 Result of Maximum Permissible Exposure (2.4G)**

| RF General Information                                                           |                           |                     |                |                                              |                       |
|----------------------------------------------------------------------------------|---------------------------|---------------------|----------------|----------------------------------------------|-----------------------|
| Frequency Range (MHz)                                                            | IEEE Std. 802.11 Protocol | Ch. Frequency (MHz) | Channel Number | Number of Transmit Chains (N <sub>TX</sub> ) | RF Output Power (dBm) |
| 2400-2483.5                                                                      | b                         | 2412-2462           | 1-11 [11]      | 3                                            | 20.258                |
| 2400-2483.5                                                                      | g                         | 2412-2462           | 1-11 [11]      | 3                                            | 23.711                |
| 2400-2483.5                                                                      | n (HT20)                  | 2412-2462           | 1-11 [11]      | 3                                            | 22.597                |
| 2400-2483.5                                                                      | n (HT40)                  | 2422-2452           | 3-9 [7]        | 3                                            | 15.559                |
| Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. |                           |                     |                |                                              |                       |

| Worst Maximum RF Output Power Result                     |                 |                                            |              |              |           |          |            |                              |
|----------------------------------------------------------|-----------------|--------------------------------------------|--------------|--------------|-----------|----------|------------|------------------------------|
| Exposure Environment                                     |                 | General Population / Uncontrolled Exposure |              |              |           |          |            |                              |
| Separation Distance (cm)                                 |                 | 20                                         |              |              |           |          |            |                              |
| Condition                                                |                 | RF Output Power (dBm)                      |              |              |           |          |            |                              |
| Modulation Mode                                          | N <sub>TX</sub> | Chain-Port 1                               | Chain-Port 2 | Chain-Port 3 | Sum Chain | DG (dBi) | EIRP Power | PD (S) (mW/cm <sup>2</sup> ) |
| 11g                                                      | 3               | 18.53                                      | 19.16        | 19.10        | 23.71     | 6.77     | 30.48      | 0.22231                      |
| Maximum Permissible Exposure Limit (mW/cm <sup>2</sup> ) |                 |                                            |              |              |           |          |            | 1                            |
| Note 1: N <sub>TX</sub> = Number of Transmit Chains      |                 |                                            |              |              |           |          |            |                              |

**1.1.4 Result of Maximum Permissible Exposure (5.2G)**

| RF General Information                                                           |                           |                     |                |                                              |                       |
|----------------------------------------------------------------------------------|---------------------------|---------------------|----------------|----------------------------------------------|-----------------------|
| Frequency Range (MHz)                                                            | IEEE Std. 802.11 Protocol | Ch. Frequency (MHz) | Channel Number | Number of Transmit Chains (N <sub>TX</sub> ) | RF Output Power (dBm) |
| 5150-5250                                                                        | a                         | 5180-5240           | 36-48 [4]      | 3                                            | 20.388                |
| 5150-5250                                                                        | n (HT20)                  | 5180-5240           | 36-48 [4]      | 3                                            | 20.672                |
| 5150-5250                                                                        | n (HT40)                  | 5190-5230           | 38-46 [2]      | 3                                            | 21.663                |
| 5150-5250                                                                        | ac (VHT20)                | 5180-5240           | 36-48 [4]      | 3                                            | 20.692                |
| 5150-5250                                                                        | ac (VHT40)                | 5190-5230           | 38-46 [2]      | 3                                            | 21.677                |
| 5150-5250                                                                        | ac (VHT80)                | 5210                | 48 [1]         | 3                                            | 16.354                |
| Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. |                           |                     |                |                                              |                       |

| Worst Maximum RF Output Power Result                     |                 |                                            |              |              |           |          |            |                              |
|----------------------------------------------------------|-----------------|--------------------------------------------|--------------|--------------|-----------|----------|------------|------------------------------|
| Exposure Environment                                     |                 | General Population / Uncontrolled Exposure |              |              |           |          |            |                              |
| Separation Distance (cm)                                 |                 | 20                                         |              |              |           |          |            |                              |
| Condition                                                |                 | RF Output Power (dBm)                      |              |              |           |          |            |                              |
| Modulation Mode                                          | N <sub>TX</sub> | Chain-Port 1                               | Chain-Port 2 | Chain-Port 3 | Sum Chain | DG (dBi) | EIRP Power | PD (S) (mW/cm <sup>2</sup> ) |
| HT40                                                     | 3               | 17.03                                      | 16.91        | 16.78        | 21.68     | 7.77     | 29.45      | 0.17515                      |
| Maximum Permissible Exposure Limit (mW/cm <sup>2</sup> ) |                 |                                            |              |              |           |          |            | 1                            |
| Note 1: N <sub>TX</sub> = Number of Transmit Chains      |                 |                                            |              |              |           |          |            |                              |

**1.1.5 Result of Maximum Permissible Exposure (5.8G)**

| RF General Information                                                           |                           |                     |                |                                              |                       |
|----------------------------------------------------------------------------------|---------------------------|---------------------|----------------|----------------------------------------------|-----------------------|
| Frequency Range (MHz)                                                            | IEEE Std. 802.11 Protocol | Ch. Frequency (MHz) | Channel Number | Number of Transmit Chains (N <sub>TX</sub> ) | RF Output Power (dBm) |
| 5725-5850                                                                        | a                         | 5745-5825           | 149-165 [5]    | 3                                            | 24.899                |
| 5725-5850                                                                        | n (HT20)                  | 5745-5825           | 149-165 [5]    | 3                                            | 24.791                |
| 5725-5850                                                                        | n (HT40)                  | 5755-5795           | 151-159 [2]    | 3                                            | 24.360                |
| 5725-5850                                                                        | ac (VHT20)                | 5745-5825           | 149-165 [5]    | 3                                            | 25.029                |
| 5725-5850                                                                        | ac (VHT40)                | 5755-5795           | 151-159 [2]    | 3                                            | 24.716                |
| 5725-5850                                                                        | ac (VHT80)                | 5775                | 155 [1]        | 3                                            | 22.238                |
| Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. |                           |                     |                |                                              |                       |

| Worst Maximum RF Output Power Result                     |                 |                                            |              |              |           |          |            |                              |
|----------------------------------------------------------|-----------------|--------------------------------------------|--------------|--------------|-----------|----------|------------|------------------------------|
| Exposure Environment                                     |                 | General Population / Uncontrolled Exposure |              |              |           |          |            |                              |
| Separation Distance (cm)                                 |                 | 20                                         |              |              |           |          |            |                              |
| Condition                                                |                 | RF Output Power (dBm)                      |              |              |           |          |            |                              |
| Modulation Mode                                          | N <sub>TX</sub> | Chain-Port 1                               | Chain-Port 2 | Chain-Port 3 | Sum Chain | DG (dBi) | EIRP Power | PD (S) (mW/cm <sup>2</sup> ) |
| VHT20                                                    | 3               | 20.59                                      | 20.04        | 20.11        | 25.03     | 7.77     | 32.80      | 0.37901                      |
| Maximum Permissible Exposure Limit (mW/cm <sup>2</sup> ) |                 |                                            |              |              |           |          |            | 1                            |
| Note 1: N <sub>TX</sub> = Number of Transmit Chains      |                 |                                            |              |              |           |          |            |                              |