

# Maximum Permissible Exposure

**Equipment** : GPON ONT  
**Brand Name** : **ADTRAN**  
**Model No.** : 424RG  
**Part No.** : 1287781Fxy (x=0~9, a~z, A~Z, blank, "-" or "+"),  
(y=0~9, a~z, A~Z, blank, "-" or "+")  
**Contained FCC ID** : HDC424RG50X  
HDC414RG24X  
**Standard** : IEEE C95.1  
**Applicant** : Adtran  
901 Explorer Blvd., Huntsville, AL 35806, US  
**Manufacturer** : XAVi Technologies Corporation  
22F., No.69, Sec. 2, Guangfu Rd., Sanchong Dist.,  
New Taipei City 241, Taiwan (R.O.C.)

The product sample received on Jun. 05, 2016 and completely tested on Dec. 30, 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.

Reviewed by:

  
Kevin Liang / Assistant Manager



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## Revision History

[illegible]

# 1 Human Exposure Assessment

## 1.1 Information

|              |                                                                |
|--------------|----------------------------------------------------------------|
| Contained ID | 1. HDC424RG50X for 5G Module<br>2. HDC414RG24X for 2.4G Module |
|--------------|----------------------------------------------------------------|

## 1.2 Product Details

|                                             |     |
|---------------------------------------------|-----|
| The difference between the report no. : N/A |     |
| The Difference                              | N/A |

|                      |     |
|----------------------|-----|
| Evaluated Test Items | N/A |
|----------------------|-----|

## 1.3 Maximum Permissible Exposure

### 1.3.1 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                    |                                   |                                   |                                          |                                                                  |

**1.3.2 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)

**1.3.3 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]      | 1                                            | 23.69                 |
| 2400-2483.5                                                                      | g                         | 2412-2462           | 1-11 [11]      | 1                                            | 19.70                 |
| 2400-2483.5                                                                      | n (HT20)                  | 2412-2462           | 1-11 [11]      | 1                                            | 19.79                 |
| 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> | RF Output Power                            | DG (dBi) | EIRP Power | PD (S) (mW/cm <sup>2</sup> ) |
| 11b                                                      | 1               | 23.69                                      | 2.00     | 25.69      | 0.07374                      |
| Maximum Permissible Exposure Limit (mW/cm <sup>2</sup> ) |                 |                                            |          |            | 1                            |
| Note 1: N <sub>TX</sub> = Number of Transmit Chains      |                 |                                            |          |            |                              |

**1.3.4 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]      | 4                                            | 24.68                 |
| 5150-5250                                                                        | n (HT20)                  | 5180-5240           | 36-48 [4]      | 4                                            | 24.26                 |
| 5150-5250                                                                        | n (HT40)                  | 5190-5230           | 38-46 [2]      | 4                                            | 24.58                 |
| 5150-5250                                                                        | ac (VHT20)                | 5180-5240           | 36-48 [4]      | 4                                            | 24.33                 |
| 5150-5250                                                                        | ac (VHT40)                | 5190-5230           | 38-46 [2]      | 4                                            | 24.79                 |
| 5150-5250                                                                        | ac (VHT80)                | 5210                | 42 [1]         | 4                                            | 18.99                 |
| 5150-5250                                                                        | ac (VHT20) (Beamforming)  | 5180-5240           | 36-48 [4]      | 4                                            | 20.50                 |
| 5150-5250                                                                        | ac (VHT40) (Beamforming)  | 5190-5230           | 38-46 [2]      | 4                                            | 20.46                 |
| 5150-5250                                                                        | ac (VHT80) (Beamforming)  | 5210                | 42 [1]         | 4                                            | 17.10                 |
| 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> | RF Output Power                            | DG (dBi) | EIRP Power | PD (S) (mW/cm <sup>2</sup> ) |
| ac (VHT20) (Beamforming)                                 | 4               | 20.50                                      | 9.72     | 30.22      | 0.20928                      |
| Maximum Permissible Exposure Limit (mW/cm <sup>2</sup> ) |                 |                                            |          |            | 1                            |
| Note 1: N <sub>TX</sub> = Number of Transmit Chains      |                 |                                            |          |            |                              |

**1.3.5 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]    | 4                                            | 23.87                 |
| 5725-5850                                                                        | n (HT20)                  | 5745-5825           | 149-165 [5]    | 4                                            | 24.05                 |
| 5725-5850                                                                        | n (HT40)                  | 5755-5795           | 151-159 [2]    | 4                                            | 24.44                 |
| 5725-5850                                                                        | ac (VHT20)                | 5745-5825           | 149-165 [5]    | 4                                            | 24.09                 |
| 5725-5850                                                                        | ac (VHT40)                | 5755-5795           | 151-159 [2]    | 4                                            | 24.48                 |
| 5725-5850                                                                        | ac (VHT80)                | 5775                | 155 [1]        | 4                                            | 22.98                 |
| 5725-5850                                                                        | ac (VHT20) (Beamforming)  | 5745-5825           | 149-165 [5]    | 4                                            | 19.40                 |
| 5725-5850                                                                        | ac (VHT40) (Beamforming)  | 5755-5795           | 151-159 [2]    | 4                                            | 20.08                 |
| 5725-5850                                                                        | ac (VHT80) (Beamforming)  | 5775                | 155 [1]        | 4                                            | 19.08                 |
| 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> | RF Output Power                            | DG (dBi) | EIRP Power | PD (S) (mW/cm <sup>2</sup> ) |
| ac (VHT40) (Beamforming)                                 | 4               | 20.08                                      | 9.72     | 29.80      | 0.18999                      |
| Maximum Permissible Exposure Limit (mW/cm <sup>2</sup> ) |                 |                                            |          |            | 1                            |
| Note 1: N <sub>TX</sub> = Number of Transmit Chains      |                 |                                            |          |            |                              |



**1.3.6 Result of Maximum Permissible Exposure (Co-location)**

| 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> | RF Output Power (dBm)                      | DG (dBi) | EIRP Power | PD (S) (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Ratio   |
| 11b (2.4GHz)                                                                                                                                                                                                                                                                                                                                                                                               | 1               | 23.69                                      | 2.00     | 25.69      | 0.07374                      | 1                           | 0.07374 |
| ac (VHT20) (Beamforming)                                                                                                                                                                                                                                                                                                                                                                                   | 4               | 20.50                                      | 9.72     | 30.22      | 0.20928                      | 1                           | 0.20928 |
| Co-location Total                                                                                                                                                                                                                                                                                                                                                                                          |                 |                                            |          |            |                              |                             | 0.28302 |
| Maximum Permissible Exposure Limit                                                                                                                                                                                                                                                                                                                                                                         |                 |                                            |          |            |                              |                             | 1       |
| <p>Note 1: NTX = Number of Transmit Chains.</p> <p>Note.2: Both of the WLAN 2.4GHz and WLAN 5GHz can transmit simultaneously, the formula of calculated the MPE is:</p> $CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$ <p>CPD = Calculation power density</p> <p>LPD = Limit of power density</p> <p>Note 3: Refer to KDB 865664 D02 RF Exposure Reporting v01r02 for MPE Calculation Colocation.</p> |                 |                                            |          |            |                              |                             |         |