



## RF Exposure Evaluation Declaration

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**FCC ID:** H8N-RG8000W

**APPLICANT:** ASKEY COMPUTER CORP

**Application Type:** Certification

**Product:** Gateway

**Model No.:** QB-GW-TAC

**Trademark:** ASKEY

**FCC Classification:** Digital Transmission System (DTS)  
Unlicensed National Information Infrastructure (UNII)  
FCC Part 15 Spread Spectrum Transmitter(DSS)  
KDB 447498 D01v06

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( Robin Wu )

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( Marlin Chen )



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standards through the calibration of the equipment and evaluated measurement uncertainty herein.

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## Revision History

| Report No.   | Version | Description                   | Issue Date |
|--------------|---------|-------------------------------|------------|
| 1512RSU00309 | Rev. 01 | Initial report                | 01-19-2016 |
| 1512RSU00309 | Rev. 02 | Added MPE of Bluetooth module | 01-29-2016 |
| 1512RSU00309 | Rev. 03 | Measure the MPE               | 02-04-2016 |
| 1512RSU00309 | Rev. 04 | Revised the FCC ID            | 02-17-2016 |

## 1. PRODUCT INFORMATION

### 1.1. Equipment Description

|                                       |                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name                          | Gateway                                                                                                                                                                                                                                                                                                                                                                      |
| Model No.                             | QB-GW-TAC                                                                                                                                                                                                                                                                                                                                                                    |
| Brand Name                            | ASKEY                                                                                                                                                                                                                                                                                                                                                                        |
| Wi-Fi Specification                   | 802.11a/b/g/n/ac                                                                                                                                                                                                                                                                                                                                                             |
| Frequency Range                       | <p><b><u>2.4GHz:</u></b></p> <p>For 802.11b/g/n-HT20:<br/>2412 ~ 2462 MHz</p> <p>For 802.11n-HT40:<br/>2422 ~ 2452 MHz</p> <p><b><u>5GHz:</u></b></p> <p>For 802.11a/n-HT20/ac-VHT20:<br/>5180~5240MHz, 5745~5825MHz</p> <p>For 802.11n-HT40/ac-VHT40:<br/>5190~5230MHz, 5755~5795MHz</p> <p>For 802.11ac-VHT80:<br/>5210MHz, 5775MHz</p>                                    |
| Type of Modulation                    | <p>802.11b: DSSS</p> <p>802.11g/a/n/ac: OFDM</p>                                                                                                                                                                                                                                                                                                                             |
| Maximum Average Output Power          | <p><b><u>For 2.4GHz Band:</u></b></p> <p>802.11b: 26.60dBm</p> <p>802.11g: 25.80dBm</p> <p>802.11n-HT20: 25.44dBm</p> <p>802.11n-HT40: 26.72dBm</p> <p><b><u>For 5GHz Band:</u></b></p> <p>802.11a: 24.91dBm</p> <p>802.11n-HT20: 25.00dBm</p> <p>802.11n-HT40: 24.57dBm</p> <p>802.11ac-VHT20: 24.93dBm</p> <p>802.11ac-VHT40: 25.03dBm</p> <p>802.11ac-VHT80: 24.22dBm</p> |
| Bluetooth Module Maximum Output Power | <p>Bluetooth v3.0+HS: 6.90(Peak)</p> <p>Bluetooth v4.0: 8.83(Average)</p>                                                                                                                                                                                                                                                                                                    |

## 1.2. Antenna Description

| Antenna Type | Frequency Band (MHz) | Tx Paths | Per Chain Max Antenna Gain (dBi) |       |       | Beam Forming & CDD Directional Gain (dBi) |
|--------------|----------------------|----------|----------------------------------|-------|-------|-------------------------------------------|
|              |                      |          | Ant 0                            | Ant 1 | Ant 2 |                                           |
| PCB Antenna  | 2412 ~2462           | 3        | 5.41                             | 2.62  | 1.99  | 8.24                                      |

| Antenna Type | Frequency Band (MHz) | Tx Paths | Per Chain Max Antenna Gain (dBi) |       |       |       | Beam Forming & CDD Directional Gain (dBi) |
|--------------|----------------------|----------|----------------------------------|-------|-------|-------|-------------------------------------------|
|              |                      |          | Ant 0                            | Ant 1 | Ant 2 | Ant 3 |                                           |
| PCB Antenna  | 5150 ~ 5250          | 4        | 4.84                             | 5.12  | 4.34  | 5.41  | 10.96                                     |
|              | 5725 ~ 5850          | 4        | 4.28                             | 5.14  | 3.48  | 5.11  | 10.55                                     |

1. The EUT supports Cyclic Delay Diversity (CDD) technology, and that CDD technology is correlated.

(1) Correlated *signals include, but are not limited to, signals transmitted in any of the following modes:*

- Unequal Antenna gains, with equal transmit powers. For Antenna gains given by  $G_1, G_2, \dots, G_N$  dBi transmit signals are correlated, then
- Directional gain =  $10 \cdot \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{\text{ANT}}]$  dBi [Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

For example: 2.4GHz Directional Gain =  $10 \cdot \log[(10^{5.41/20} + 10^{2.62/20} + 10^{1.99/20})^2 / 2] = 8.24$  dBi

5150 ~ 5250MHz Directional Gain =  $10 \cdot \log[(10^{4.84/20} + 10^{5.12/20} + 10^{4.34/20} + 10^{5.41/20})^2 / 4] = 10.96$  dBi

## 2. RF Exposure Evaluation

### 2.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

#### 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> ) | Average Time (Minutes) |
|-----------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|------------------------|
| (A) Limits for Occupational/ Control Exposures            |                               |                               |                                     |                        |
| 300-1500                                                  | --                            | --                            | f/300                               | 6                      |
| 1500-100,000                                              | --                            | --                            | 5                                   | 6                      |
| (B) Limits for General Population/ Uncontrolled Exposures |                               |                               |                                     |                        |
| 300-1500                                                  | --                            | --                            | f/1500                              | 6                      |
| 1500-100,000                                              | --                            | --                            | 1                                   | 30                     |

f= Frequency in MHz

Calculation Formula:  $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$r$  = distance between observation point and center of the radiator in cm

$P_d$  is the limit of MPE, 1mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance  $r$  where the MPE limit is reached.

### 2.2. Test Procedure Used

1. Setup the EUT and simulators as shown in the test setup photo;
2. Make the EUT transmit at Max Power(refer section 1.1) in each band;
3. Move the Field Strength Meter to find position of each face which the Max Field Strength, and keep distance 20cm between the probe with EUT;
4. Rotating the Field Strength Meter to X, Y, Z axial, and record the Max Field Strength in each position of each face.

| Instrument           | Manufacturer | Type No. | Measurement Range | Cali. Interval | Cali. Due Date |
|----------------------|--------------|----------|-------------------|----------------|----------------|
| Field Strength Meter | AR           | FL7006   | 100kHz ~ 6GHz     | 1 year         | 2016/09/09     |

### 2.3. Test Result of RF Exposure Evaluation

|           |                        |
|-----------|------------------------|
| Product   | Gateway                |
| Test Item | RF Exposure Evaluation |

Antenna Gain: refer to the section 1.2; the maximum Gain measured in fully anechoic chamber is 1dBi for Bluetooth Module.

#### For 2.4GHz ISM Band:

| Test Mode                   | Frequency Band (MHz) | Maximum Average Output Power (dBm) |
|-----------------------------|----------------------|------------------------------------|
| 802.11b/g/n-HT20/<br>n-HT40 | 2412 ~ 2462          | 26.72                              |

#### For 5GHz UNII Band:

| Test Mode                                              | Frequency Band (MHz) | Maximum Average Output Power (dBm) |
|--------------------------------------------------------|----------------------|------------------------------------|
| 802.11a/n-HT20/<br>n-H40/ac-VHT20<br>ac-VHT40/ac-VHT80 | 5180 ~ 5240          | 24.62                              |
|                                                        | 5745 ~ 5825          | 25.03                              |

#### Bluetooth Module

| Test Mode      | Frequency Band (MHz) | Maximum Average Output Power (dBm) | Power Density at R = 20 cm (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) |
|----------------|----------------------|------------------------------------|--------------------------------------------------|-----------------------------|
| Bluetooth v4.0 | 2402 ~ 2480          | 8.83                               | 0.0019                                           | 1                           |

### MPE Measurement Result

| Test Mode                   | Frequency Band (MHz) | Position | Field Strength (V/m) |
|-----------------------------|----------------------|----------|----------------------|
| 802.11b/g/n-HT20/<br>n-HT40 | 2412 ~ 2462          | Front    | 15.84                |
|                             |                      | Back     | 20.17                |
|                             |                      | Left     | 14.97                |
|                             |                      | Right    | 22.47                |
|                             |                      | Top      | 24.78                |

| Test Mode                                              | Frequency Band (MHz) | Position | Field Strength (V/m) |
|--------------------------------------------------------|----------------------|----------|----------------------|
| 802.11a/n-HT20/<br>n-H40/ac-VHT20<br>ac-VHT40/ac-VHT80 | 5180 ~ 5240          | Front    | 21.88                |
|                                                        |                      | Back     | 21.34                |
|                                                        |                      | Left     | 26.17                |
|                                                        |                      | Right    | 16.74                |
|                                                        |                      | Top      | 22.06                |

| Test Mode                                              | Frequency Band (MHz) | Position | Field Strength (V/m) |
|--------------------------------------------------------|----------------------|----------|----------------------|
| 802.11a/n-HT20/<br>n-H40/ac-VHT20<br>ac-VHT40/ac-VHT80 | 5745 ~ 5825          | Front    | 17.79                |
|                                                        |                      | Back     | 16.03                |
|                                                        |                      | Left     | 24.07                |
|                                                        |                      | Right    | 18.40                |
|                                                        |                      | Top      | 18.99                |

Both of the WLAN 2.4GHz Band, WLAN 5GHz Band & Bluetooth Module can transmit simultaneously.

**Therefore,  $\text{Max } P_d = (V/m)^2 / 3770 \text{ mW/cm}^2$**

$\text{Max } P_d = \{(2.4\text{GHz Max Field Strength})^2 + (5\text{GHz Max Field Strength})^2\} / 3770 + P_d(\text{Bluetooth Module}) = (24.78^2 + 26.17^2) / 377 + 0.0019 = 0.3464 \text{ mW/cm}^2 < 1 \text{ mW/cm}^2$

Note: The detail Measurement result can refer to the Test Setup Photos.

The End