



## 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

Reviewed By : Robin Wu  
( Robin Wu )

Approved By : Marlin Chen  
( 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>            For 802.11b/g/n-HT20:            2412 ~ 2462 MHz            For 802.11n-HT40:            2422 ~ 2452 MHz</p> <p><b><u>5GHz:</u></b>            For 802.11a/n-HT20/ac-VHT20:            5180~5240MHz, 5745~5825MHz            For 802.11n-HT40/ac-VHT40:            5190~5230MHz, 5755~5795MHz            For 802.11ac-VHT80:            5210MHz, 5775MHz</p>
Type of Modulation	802.11b: DSSS 802.11g/a/n/ac: OFDM
Maximum Average Output Power	<p><b><u>For 2.4GHz Band:</u></b>            802.11b: 26.60dBm            802.11g: 25.80dBm            802.11n-HT20: 25.44dBm            802.11n-HT40: 26.72dBm</p> <p><b><u>For 5GHz Band:</u></b>            802.11a: 24.91dBm            802.11n-HT20: 25.00dBm            802.11n-HT40: 24.57dBm            802.11ac-VHT20: 24.93dBm            802.11ac-VHT40: 25.03dBm            802.11ac-VHT80: 24.22dBm</p>
Bluetooth Module Maximum Output Power	Bluetooth v3.0+HS: 6.90(Peak) Bluetooth v4.0: 8.83(Average)

## 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:  $Pd = (Pout \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

Pd = power density in mW/cm<sup>2</sup>

Pout = 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

Pd 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/ n-HT40	2412 ~ 2462	26.72

#### For 5GHz UNII Band:

Test Mode	Frequency Band (MHz)	Maximum Average Output Power (dBm)
802.11a/n-HT20/ n-H40/ac-VHT20 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/ 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/ n-H40/ac-VHT20 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/ n-H40/ac-VHT20 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,  $Max P_d = (V/m)^2 / 3770 \text{ mW/cm}^2$**

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

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

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