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Report Version: V01
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RF Exposure Evaluation Declaration

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)

Reviewed By : Robin Wu
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Revision History

Report No.	Version	Description	Issue Date
1512RSU00314	Rev. 01	Initial report	02-22-2016

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	**2.4GHz:** For 802.11b/g/n-HT20: 2412 ~ 2462 MHz For 802.11n-HT40: 2422 ~ 2452 MHz **5GHz:** For 802.11a/n-HT20: 5180~5320MHz, 5500~5700MHz, 5745~5825MHz For 802.11ac-VHT20: 5180~5320MHz, 5500~5720MHz, 5745~5825MHz For 802.11n-HT40: 5190~5310MHz, 5510~5670MHz, 5755~5795MHz For 802.11ac-VHT40: 5190~5310MHz, 5510~5710MHz, 5755~5795MHz For 802.11ac-VHT80: 5210MHz, 5290MHz, 5530MHz, 5610MHz, 5690MHz, 5775MHz
Type of Modulation	802.11b: DSSS 802.11g/a/n/ac: OFDM
Maximum Average Output Power	**For 2.4GHz Band:** 802.11b: 26.60dBm 802.11g: 25.80dBm 802.11n-HT20: 25.44dBm 802.11n-HT40: 26.72dBm **For 5GHz Band:** 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

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)				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
	5250 ~ 5350	4	4.74	5.02	4.39	5.41	10.92
	5470 ~ 5725	4	4.53	5.14	4.51	4.98	10.81
	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, …, G_N dBi transmit signals are correlated, then
- Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2/N_{ANT}]$ 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 = $10*\log[(10^{4.13/20} + 10^{3.82/20})^2/2]$ = 6.99 dBi

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

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^2)	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: $Pd = (Pout*G)/(4*pi*r^2)$

Where
Pd = power density in mW/cm^2
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, $1mW/cm^2$. 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
	5260 ~ 5320	18.58
	5500 ~ 5720	18.68
	5745 ~ 5825	25.03

Bluetooth Module

Test Mode	Frequency Band (MHz)	Maximum Average Output Power (dBm)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)
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
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
802.11a/n-HT20/ n-H40/ac-VHT20 ac-VHT40/ac-VHT80	5260 ~ 5320	Front	18.08
		Back	18.44
		Left	20.43
		Right	12.59
		Top	18.57
802.11a/n-HT20/ n-H40/ac-VHT20 ac-VHT40/ac-VHT80	5500 ~ 5720	Front	17.10
		Back	18.54
		Left	19.84
		Right	13.72
		Top	17.42
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 = $(V/m)^2/3770$ mW/cm^2

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

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

The End