RF Exposure Evaluation Declaration

FCC ID:	H8N-WHD0110
APPLICANT:	ASKEY COMPUTER CORP

Application Type:	Certification
Product:	Smart Gateway
Model No.:	WHD0110(RoHS), WHD0111(RoHS)
Trademark:	ASKEY
FCC Classification:	Digital Transmission System (DTS)
	Unlicensed National Information Infrastructure (UNII)

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Revision History

Report No.	Version	Description	Issue Date
1507RSU00809	Rev. 01	Initial report	10-12-2015

1. PRODUCT INFORMATION

1.1. Equipment Description

Product Name	Smart Gateway
Model No.	WHD0110(RoHS), WHD0111(RoHS)
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: 25.40dBm 802.11g: 22.28dBm 802.11n-HT20: 22.16dBm 802.11n-HT40: 22.10dBm **For 5GHz Band:** 802.11a: 22.33dBm 802.11n-HT20: 21.51dBm 802.11n-HT40: 23.06dBm 802.11ac-VHT20: 22.85dBm 802.11ac-VHT40: 23.34dBm 802.11ac-VHT80: 22.36dBm

1.2. Antenna Description

Antenna Type	Frequency Band (MHz)	Tx Paths	Per Chain Max Antenna Gain (dBi)		CDD Directional Gain (dBi)
			Ant 0	Ant 1	
PCB Antenna	2412 ~2462	2	4.13	3.82	6.99
	5150 ~ 5250	2	3.90	3.53	6.73
	5250 ~ 5350	2	3.86	3.42	6.66
	5470 ~ 5725	2	4.10	3.65	6.89
	5725 ~ 5850	2	4.00	4.35	7.19

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

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*r2)

Where
Pd = power density in mW/cm2
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/cm². 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 Result of RF Exposure Evaluation

Product	Smart Gateway
Test Item	RF Exposure Evaluation

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 6.99dBi for 2.4GHz, 6.73dBi for 5.2GHz, 6.66dBi for 5.3GHz, 6.89dBi for 5.6GHz and 7.19dBi for 5.80GHz in logarithm scale, 1dBi for Bluetooth Module.

For 2.4GHz ISM Band:

Test Mode	Frequency Band (MHz)	Maximum Average Output Power (dBm)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)
802.11b/g/n-HT20/ n-HT40	2412 ~ 2462	25.40	0.3449	1
Bluetooth	2402 ~ 2480	5.56	0.0009	1

For 5GHz UNII Band:

Test Mode	Frequency Band (MHz)	Maximum Average Output Power (dBm)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)
802.11a/n-HT20/ n-H40/ac-VHT20 ac-VHT40/ac-VHT80	5180 ~ 5240	23.34	0.2022	1
	5260 ~ 5320	22.75	0.1737	1
	5500 ~ 5720	22.51	0.1733	1
	5745 ~ 5825	22.85	0.2008	1

CONCULISON:

Both of the WLAN 2.4GHz Band and WLAN 5GHz Band can transmit simultaneously. Therefore, the Max Power Density at R (20 cm) = 0.3449mW/cm^2+ 0.2022mW/cm^2 + 0.0009 mW/cm^2 = 0.5480mW/cm^2 < 1mW/cm^2.

So the EUT complies with the requirement.

The End