



## RF Exposure Report

**Report No.:** SA150226E05

**FCC ID:** PPD-QCA9008-TBD1

**Test Model:** QCA9008-TBD1

**Received Date:** Feb. 26, 2015

**Test Date:** June 18 to 23, 2015

**Issued Date:** July 31, 2015

**Applicant:** Qualcomm Atheros, Inc.

**Address:** 1700 Technology Drive, San Jose, CA 95110

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Hsin Chu Laboratory

**Lab Address:** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.

**Test Location (1):** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.

**Test Location (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen, Chiung Lin Hsiang, Hsin  
Chu Hsien 307, Taiwan R.O.C.

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### Release Control Record

Issue No.	Description	Date Issued
SA150226E05	Original release.	July 31, 2015



## 2 RF Exposure

### 2.1 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)
Limits For General Population / Uncontrolled Exposure				
300-1500	...	...	F/1500	30
1500-100,000	...	...	1.0	30

F = Frequency in MHz

### 2.2 MPE Calculation Formula

$$Pd = (P_{out} * G) / (4 * \pi * r^2)$$

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

### 2.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user.

So, this device is classified as **Mobile Device**.

### 3 Antenna Gain

The antenna gain was declared by client; please refer to the following table:

Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5GHz Cable Loss (dBi)	Connector Type	Cable Length (mm)
Chain (0)	WNC	81-EBJ15.005	PIFA	3.00	5.15~5.35GHz: 2.56	1.15	5.15~5.35GHz: 1.70	IPEX	300
					5.47~5.725GHz: 4.76		5.47~5.725GHz: 1.74		
					5.725~5.85GHz: 4.76		5.725~5.85GHz: 1.79		
Chain (1)	WNC	81-EBJ15.005	PIFA	3.62	5.15~5.35GHz: 3.08	1.15	5.15~5.35GHz: 1.70	IPEX	300
					5.47~5.725GHz: 3.31		5.47~5.725GHz: 1.74		
					5.725~5.85GHz: 2.42		5.725~5.85GHz: 1.79		

Note: 1. Above antenna gains of antenna are Total (H+V).

For testing, we select the highest gain on each frequency band for calculation and testing  
The detail information as below:

Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5GHz Cable Loss (dBi)	Connector Type	Cable Length (mm)
Chain (0)+(1)	WNC	81-EBJ15.005	PIFA	3.62	5.15~5.35GHz: 3.08	1.15	5.15~5.35GHz: 1.70	IPEX	300
					5.47~5.725GHz: 4.76		5.47~5.725GHz: 1.74		
					5.725~5.85GHz: 4.76		5.725~5.85GHz: 1.79		

#### 4 Calculation Result Of Maximum Conducted Power

**For WLAN: 15.247 (2.4GHz):**

##### 802.11b

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2472	294.47	6.63	20	0.26963	1

NOTE: 1. Directional gain = 3.62dBi + 10log(2) = 6.63dBi

##### 802.11g

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2472	430.629	6.63	20	0.39431	1

NOTE: 1. Directional gain = 3.62dBi + 10log(2) = 6.63dBi

##### VHT20

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2472	439.601	6.63	20	0.40252	1

NOTE: 1. Directional gain = 3.62dBi + 10log(2) = 6.63dBi

##### VHT40

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2422-2462	416.898	6.63	20	0.38173	1

NOTE: 1. Directional gain = 3.62dBi + 10log(2) = 6.63dBi

**For WLAN: 15.407 (5GHz):**
**802.11a**

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5180 - 5240, 5260 - 5320	70.001	6.09	20	0.05660	1
5500 - 5720	65.547	7.77	20	0.07803	1
5745 - 5825	71.132	7.77	20	0.08468	1

- NOTE: 1. 5150~5350MHz: Directional gain = 3.08dBi + 10log(2) = 6.09dBi  
 2. 5470~5725MHz: Directional gain = 4.76dBi + 10log(2) = 7.77dBi  
 3. 5725~5850MHz: Directional gain = 4.76dBi + 10log(2) = 7.77dBi

**802.11ac (VHT20)**

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5180 - 5240, 5260 - 5320	75.315	6.09	20	0.06090	1
5500 - 5720	69.781	7.77	20	0.08307	1
5745 - 5825	68.244	7.77	20	0.08124	1

- NOTE: 1. 5150~5350MHz: Directional gain = 3.08dBi + 10log(2) = 6.09dBi  
 2. 5470~5725MHz: Directional gain = 4.76dBi + 10log(2) = 7.77dBi  
 3. 5725~5850MHz: Directional gain = 4.76dBi + 10log(2) = 7.77dBi

**802.11ac (VHT40)**

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5190 - 5230, 5270 - 5310	57.081	6.09	20	0.04616	1
5510 - 5710	54.646	7.77	20	0.06506	1
5755 - 5795	44.084	7.77	20	0.05248	1

- NOTE: 1. 5150~5350MHz: Directional gain = 3.08dBi + 10log(2) = 6.09dBi  
 2. 5470~5725MHz: Directional gain = 4.76dBi + 10log(2) = 7.77dBi  
 3. 5725~5850MHz: Directional gain = 4.76dBi + 10log(2) = 7.77dBi



### 802.11ac (VHT80)

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5210 - 5290	11.56	6.09	20	0.05660	1
5530 - 5690	15.66	7.77	20	0.07803	1
5775	11.26	7.77	20	0.08468	1

- NOTE:
1. 5150~5350MHz: Directional gain = 3.08dBi + 10log(2) = 6.09dBi
  2. 5470~5725MHz: Directional gain = 4.76dBi + 10log(2) = 7.77dBi
  3. 5725~5850MHz: Directional gain = 4.76dBi + 10log(2) = 7.77dBi

### For Bluetooth:

Frequency Band (MHz)	Max power (dBm)	Max power (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2402-2480	11.02	12.647	3.62	20	0.00579	1.00

### For WLAN (60GHz):

Max EIRP (mW)	Separation Distance (cm)	Power Density (mW/cm <sup>2</sup> )	FCC Limit (mW/cm <sup>2</sup> )
835.620	20	0.16624	1

### Conclusion:

The formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

$$\text{WLAN (5GHz) + Bluetooth + WLAN (60GHz)} = 0.08468 + 0.00579 + 0.16624 = 0.257$$

$$\text{WLAN (2.4GHz) + WLAN (60GHz)} = 0.40252 + 0.16624 = 0.569$$

**Therefore the maximum calculations of above situations are less than the "1" limit.**

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