

## RF Exposure Report

**Report No.:** SA150107E07H

**FCC ID:** PPD-QCNFA364AH

**Test Model:** QCNFA364A

**Received Date:** Aug. 18, 2015

**Test Date:** Sep. 23 to Oct. 01, 2015

**Issued Date:** Dec. 04, 2015

**Applicant:** Qualcomm Atheros, Inc.

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**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
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### Release Control Record

Issue No.	Description	Date Issued
SA150107E07H	Original release.	Dec. 04, 2015



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## 1 Certificate of Conformity

**Product:** 802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card

**Brand:** Qualcomm Atheros

**Test Model:** QCNFA364A

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** Qualcomm Atheros, Inc.

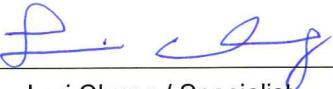
**Test Date:** Sep. 23 to Oct. 01, 2015

**Standards:** FCC Part 2 (Section 2.1091)

KDB 447498 D01

IEEE C95.1

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :**  , **Date:** Dec. 04, 2015  
Lori Chung / Specialist

**Approved by :**  , **Date:** Dec. 04, 2015  
May Chen / Manager

## 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

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

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

This report is prepared for FCC class II change. The difference compared with the original design is as the following:

- ◆ Add new antennas (Antenna Set 2) as following table:

Original																
Antenna Set 1																
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	Band 1&2: 2.56	1.15	Band 1&2: 1.70	IPEX	300							
					Band 3: 4.76		Band 3: 1.74									
					Band 4: 4.76		Band 4: 1.79									
Chain (1)	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08	1.15	Band 1&2: 1.70	IPEX	300							
					Band 3: 3.31		Band 3: 1.74									
					Band 4: 2.42		Band 4: 1.79									
Newly																
Antenna Set 2																
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)	INPAQ	DAM-I6-H-DB-800-10-17	Dipole	1.13	Band 1&2: 1.33	NA	NA	SMA RP Plug	900							
					Band 3: -0.63											
					Band 4: -0.97											
Chain (1)	INPAQ	DAM-I6-H-DB-800-10-17	Dipole	1.29	Band 1&2: 1.94	NA	NA	SMA RP Plug	900							
					Band 3: -0.49											
					Band 4: -0.93											

#### 4 Calculation Result Of Maximum Conducted Power

For WLAN: 15.247 (2.4GHz):

##### 802.11b

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2472	23.51	224.404	4.22	20	0.11797	1.00

NOTE: 1. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.22 \text{dBi}$

2. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

##### 802.11g

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2472	22.51	178.25	4.22	20	0.09370	1.00

NOTE: 1. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.22 \text{dBi}$

2. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

##### VHT20

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2412-2472	22.51	178.25	4.22	20	0.09370	1.00

NOTE: 1. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.22 \text{dBi}$

2. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

##### VHT40

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2422-2462	21.51	141.59	4.22	20	0.07443	1.00

NOTE: 1. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.22 \text{dBi}$

2. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

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

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5180 - 5240, 5260 - 5320	22.01	158.866	4.65	20	0.09221	1.00
5500 - 5720	22.01	158.866	2.45	20	0.05556	1.00
5745 - 5825	23.01	200	2.06	20	0.06394	1.00

NOTE: 1. 5150~5250MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.65 \text{dBi}$   
 2. 5250~5350MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.65 \text{dBi}$   
 3. 5470~5725MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 2.45 \text{dBi}$   
 4. 5470~5725MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 2.06 \text{dBi}$   
 5. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

**802.11ac (VHT20)**

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5180 - 5240, 5260 - 5320	22.01	158.866	4.65	20	0.09221	1.00
5500 - 5720	22.01	158.866	2.45	20	0.05556	1.00
5745 - 5825	23.01	200	2.06	20	0.06394	1.00

NOTE: 1. 5150~5250MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.65 \text{dBi}$   
 2. 5250~5350MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.65 \text{dBi}$   
 3. 5470~5725MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 2.45 \text{dBi}$   
 4. 5470~5725MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 2.06 \text{dBi}$   
 5. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

**802.11ac (VHT40)**

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5190 - 5230	22.01	158.866	4.65	20	0.09221	1.00
5270 - 5310	22.01	158.866	2.45	20	0.05556	1.00
5510 - 5710	22.01	158.866	2.06	20	0.06394	1.00
5755 - 5795	23.01	200	2.06	20	0.06394	1.00

NOTE: 1. 5150~5250MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.65 \text{dBi}$   
 2. 5250~5350MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.65 \text{dBi}$   
 3. 5470~5725MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 2.45 \text{dBi}$   
 4. 5470~5725MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 2.06 \text{dBi}$   
 5. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

**802.11ac (VHT80)**

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
5210 - 5290	18.01	63.246	4.65	20	0.03671	1.00
5530 - 5690	21.01	126.192	2.45	20	0.04413	1.00
5775	22.01	158.866	2.06	20	0.05079	1.00

NOTE: 1. 5150~5250MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.65\text{dBi}$   
 2. 5250~5350MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 4.65\text{dBi}$   
 3. 5470~5725MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 2.45\text{dBi}$   
 4. 5470~5725MHz: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 2.06\text{dBi}$   
 5. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

**For BT-EDR:**

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2402-2480	11.50	14.125	1.29	20	0.00378	1.00

NOTE: 1. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

**For BT-LE:**

Frequency Band (MHz)	Max power Avg. (dBm)	Max power Avg. (mW)	Antenna gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
2402-2480	3	1.995	1.29	20	0.00053	1.00

NOTE: 1. This power include tune-up tolerance range that specified in QCNFA364A Tune Up power table

**Conclusion:**

Both of the Bluetooth and WLAN (5GHz) can transmit simultaneously, the formula of calculated the MPE is:

$$\text{CPD}_1 / \text{LPD}_1 + \text{CPD}_2 / \text{LPD}_2 + \dots \text{etc.} < 1$$

**CPD = Calculation power density**

**LPD = Limit of power density**

Therefore, the worst-case situation is  $0.09221 / 1 + 0.00378 / 1 = 0.096$ , which is less than "1".

--- END ---