

# RF EXPOSURE REPORT

**REPORT NO.:** SA140808E04

**MODEL NO.: QCNFA324** 

FCC ID: PPD-QCNFA324

**RECEIVED:** Aug. 08, 2014

TESTED: Oct. 07 to 21, 2014

**ISSUED:** Oct. 24, 2014

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.

This report should not be used by the client to claim product certification, approval, or endorsement by any government agencies.

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification



# **TABLE OF CONTENTS**

REL	EASE CONTROL RECORD	.3
1.	CERTIFICATION	. 4
2.	RF EXPOSURE LIMIT	. 5
3.	MPE CALCULATION FORMULA	. 5
4.	CLASSIFICATION	. 5
5.	ANTENNA GAIN	. 6
6.	CALCULATION RESULT OF MAXIMUM CONDUCTED POWER	. 7



# **RELEASE CONTROL RECORD**

ISSUE NO. REASON FOR CHANGE		DATE ISSUED
SA140808E04	Original release	Oct. 24, 2014

Report No.: SA140808E04 3 of 11 Report Format Version 5.0.1



## 1. CERTIFICATION

PRODUCT: 2x2 802.11A/B/G/N/AC WiFi + Bluetooth Module

**BRAND NAME:** Qualcomm Atheros

MODEL NO.: QCNFA324

TEST SAMPLE: R&D SAMPLE

APPLICANT: Qualcomm Atheros, Inc.

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

KDB 447498 D03

**IEEE C95.1** 

The above equipment (Model: QCNFA324) 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.

( Claire Kuan, Specialist )

APPROVED BY: , DATE: Oct. 24, 2014

( May Chen, Manager )



# 2. RF EXPOSURE LIMIT

# LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

FREQUENCY RANGE (MHz)		MAGNETIC FIELD STRENGTH (A/m)	POWER DENSITY (mW/cm²)	AVERAGE TIME (minutes)				
LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE								
300-1500			F/1500	30				
1500-100,000			1.0	30				

F = Frequency in MHz

# 3. 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

## 4. 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**.

Report No.: SA140808E04 5 of 11 Report Format Version 5.0.1



# 5. ANTENNA GAIN

The antenna provided to the EUT, please refer to the following table:

THE ante	The afficient provided to the EOT, please refer to the following table.								
Antenna set 1									
Transmitter Circuit	Brand	Model	Antenna Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
Chain (0)	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08 Band 3: 4.76 Band 4: 4.76	1.15	Band 1&2:1.70 Band 3: 1.74 Band 4: 1.79	IPEX	300
Chain (1)	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08 Band 3: 4.76 Band 4: 4.76	1.15	Band 1&2:1.70 Band 3: 1.74 Band 4: 1.79	IPEX	300
				Antenna	set 2				
Transmitter Circuit	Brand	Model	Antenna Type	2.4GHz Gain w cable loss (dB			Cable Loss (dBi)	Connector Type	Cable Length (mm)
Chain (0)	Tongda	T-543-8201044- (Ant 1)	·A PIFA	3.572	Band 18 Band 3 Band 4		NA	IPEX	77
Chain (1)	Tongda	T-543-8201044- (Ant 2)	·A PIFA	3.325	Band 1& Band 3 Band 4	-	NA	IPEX	71



## 6. CALCULATION RESULT OF MAXIMUM CONDUCTED POWER

For WLAN: 15.247(2.4GHz - WLAN):

#### 802.11b

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm²)	LIMIT (mW/cm²)
2412-2462	200	6.63	20	0.18313	1.00

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

2. This power include tune-up tolerance range that specified in QCNFA324 Tune Up power table

#### 802.11g

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm²)	LIMIT (mW/cm²)
2412-2462	178.25	6.63	20	0.16321	1.00

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

2. This power include tune-up tolerance range that specified in QCNFA324 Tune Up power table

#### VHT20

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm²)	LIMIT (mW/cm²)
2412-2462	178.25	6.63	20	0.16321	1.00

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

2. This power include tune-up tolerance range that specified in QCNFA324 Tune Up power table

#### **VHT40**

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm²)	LIMIT (mW/cm²)
2422-2452	79.622	6.63	20	0.07291	1.00

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

2. This power include tune-up tolerance range that specified in QCNFA324 Tune Up power table

Report No.: SA140808E04 7 of 11 Report Format Version 5.0.1



# For WLAN: 15.247(2.4GHz - BT\_LE):

# BT\_LE

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm²)	LIMIT (mW/cm²)
2402-2480	1.972	3.62	20	0.00090	1.00

Report No.: SA140808E04 8 of 11 Report Format Version 5.0.1



# For WLAN: 15.407(5GHz):

#### 802.11a

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm <sup>2</sup> )	LIMIT (mW/cm²)
5180 - 5240, 5260 - 5320	100.238	6.09	20	0.08105	1.00
5500 -5580 & 5660 - 5720	105.88	7.77	20	0.12605	1.00
5745 - 5825	100.238	7.77	20	0.11933	1.00

**NOTE:** 1. Band  $1\sim2$ : Directional gain = 3.08dBi +  $10\log(2) = 6.09$ dBi

2. Band 3 : Directional gain = 4.76dBi + 10log(2) = 7.77dBi

3. Band 4 : Directional gain = 4.76dBi + 10log(2) = 7.77dBi

4. This power include tune-up tolerance range that specified in QCNFA324 Tune Up power table

#### 802.11ac(VHT20)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm²)	LIMIT (mW/cm²)
5180 - 5240, 5260 - 5320	79.622	6.09	20	0.06438	1.00
5500 -5580 & 5660 - 5720	95.895	7.77	20	0.11416	1.00
5745 - 5825	79.622	7.77	20	0.09479	1.00

**NOTE:** 1. Band  $1\sim2$ : Directional gain = 3.08dBi +  $10\log(2) = 6.09$ dBi

2. Band 3 : Directional gain = 4.76dBi + 10log(2) = 7.77dBi

3. Band 4 : Directional gain = 4.76dBi + 10log(2) = 7.77dBi

4. This power include tune-up tolerance range that specified in QCNFA324 Tune Up power table

## 802.11ac(VHT40)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm <sup>2</sup> )	LIMIT (mW/cm²)
5190-5230 5270-5310	63.246	6.09	20	0.05114	1.00
5510 - 5550 & 5670- 5710	110.185	7.77	20	0.13118	1.00
5755 - 5795	63.246	7.77	20	0.07529	1.00

**NOTE:** 1. Band  $1\sim2$ : Directional gain = 3.08dBi +  $10\log(2)$  = 6.09dBi

2. Band 3 : Directional gain = 4.76dBi + 10log(2) = 7.77dBi

3. Band 4 : Directional gain = 4.76dBi + 10log(2) = 7.77dBi

4. This power include tune-up tolerance range that specified in QCNFA324 Tune Up power table

Report No.: SA140808E04 9 of 11 Report Format Version 5.0.1



# 802.11ac(VHT80)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm <sup>2</sup> )	LIMIT (mW/cm²)
5210, 5290	31.698	6.09	20	0.02563	1.00
5530, 5690	95.25	7.77	20	0.11340	1.00
5775	35.566	7.77	20	0.04234	1.00

**NOTE:** 1. Band 1~2 : Directional gain = 3.08dBi + 10log(2) = 6.09dBi

2. Band 3 : Directional gain = 4.76dBi + 10log(2) = 7.77dBi

3. Band 4 : Directional gain = 4.76dBi + 10log(2) = 7.77dBi

4. This power include tune-up tolerance range that specified in QCNFA324 Tune Up power table

Report No.: SA140808E04 10 of 11 Report Format Version 5.0.1



## For BT:

## **GFSK**

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm²)	LIMIT (mW/cm²)
2402-2480	14.555	3.62	20	0.00666	1.00

#### 8DPSK

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm <sup>2</sup> )	LIMIT (mW/cm²)
2402-2480	11.776	3.62	20	0.00539	1.00

## **CONCLUSION:**

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

 $CPD_1/LPD_1 + CPD_2/LPD_2 + \dots etc. < 1$ 

**CPD = Calculation power density** 

LPD = Limit of power density

Therefore, the worst-case situation is 0.13118 / 1 + 0.00666 / 1 = 0.13784, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

--- END ---