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.

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RELEASE CONTROL RECORD

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

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.

PREPARED BY : _____ , **DATE:** Oct. 24, 2014

(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)	ELECTRIC FIELD STRENGTH (V/m)	MAGNETIC FIELD STRENGTH (A/m)	POWER DENSITY (mW/cm^2)	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^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

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**.

5. ANTENNA GAIN

The antenna provided to the EUT, 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 with cable loss (dBi)	5GHz Gain with cable loss (dBi)	Cable Loss (dBi)	Connector Type	Cable Length (mm)
Chain (0)	Tongda	T-543-8201044-A (Ant 1)	PIFA	3.572	Band 1&2: 3.002 Band 3: 4.546 Band 4: 4.416	NA	IPEX	77
Chain (1)	Tongda	T-543-8201044-A (Ant 2)	PIFA	3.325	Band 1&2: 2.942 Band 3: 4.622 Band 4: 4.586	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/ cm^2)	LIMIT (mW/cm^2)
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/ cm^2)	LIMIT (mW/cm^2)
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/ cm^2)	LIMIT (mW/cm^2)
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/ cm^2)	LIMIT (mW/cm^2)
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

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/ cm^2)	LIMIT (mW/cm^2)
2402-2480	1.972	3.62	20	0.00090	1.00

For WLAN: 15.407(5GHz):

802.11a

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
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 1~2 : 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

802.11ac(VHT20)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
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 1~2 : 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

802.11ac(VHT40)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
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 1~2 : 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

802.11ac(VHT80)

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
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

For BT:

GFSK

FREQUENCY BAND (MHz)	MAX POWER AVG. (mW)	ANTENNA GAIN (dBi)	DISTANCE (cm)	POWER DENSITY (mW/ cm^2)	LIMIT (mW/cm^2)
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^2)	LIMIT (mW/cm^2)
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:

$CPD_1 / LPD_1 + CPD_2 / LPD_2$ + ……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.

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