

RF Exposure Report

Report No.: SA180117E07S

FCC ID: PPD-QCNFA324

Test Model: QCNFA324

Received Date: Aug. 08, 2014

Test Date: Oct. 07 to 21, 2014

Issued Date: Oct. 15, 2019

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: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan.

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan.

**FCC Registration /
Designation Number:** 723255 / TW2022

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

Table of Contents

Release Control Record	3
1 Certificate of Conformity.....	4
2 RF Exposure.....	5
2.1 Limits For Maximum Permissible Exposure (MPE).....	5
2.2 MPE Calculation Formula	5
2.3 Classification	5
2.4 Antenna Gain	6
2.5 Calculation Result of Maximum Conducted Power	7

Release Control Record

Issue No.	Description	Date Issued
SA180117E07S	Original release.	Oct. 15, 2019

1 Certificate of Conformity

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

Brand: Qualcomm Atheros

Test Model: QCNFA324

Sample Status: R&D SAMPLE

Applicant: Qualcomm Atheros, Inc.

Test Date: Oct. 07 to 21, 2014

Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.3-1992

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:** Oct. 15, 2019
Claire Kuan / Specialist

Approved by :  _____, **Date:** Oct. 15, 2019
Clark Lin / Technical 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 ²)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	f/1500	30
1500-100,000	1.0	30

f = Frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Formula

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

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

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**.

2.4 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	

2.5 Calculation Result of Maximum Conducted Power

The Maximum power was copied from the original test report (Date of Grant: 05/29/2015)

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WLAN 2.4GHz	2412-2472	485	6.63	20	0.44409	1
WLAN U-NII-1	5180-5240	80	6.09	20	0.06469	1
WLAN U-NII-2A	5260-5320	74.9	6.09	20	0.06056	1
WLAN U-NII-2C	5500-5720	50.1	7.77	20	0.05964	1
WLAN U-NII-3	5745-5825	63.7	7.77	20	0.07583	1
Bluetooth (BT-EDR)	2402-2480	15	3.62	20	0.00687	1
Bluetooth (BT-LE)	2402-2480	2	3.62	20	0.00092	1

Note:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. This power include tune-up tolerance range that specified in QCNFA324 Tune Up power table
3. For WLAN 2.4GHz: Directional gain = 3.62dBi + 10log(2) = 6.63dBi
4. For WLAN 5GHz(U-NII-1 & U-NII-2A): Directional gain = 3.08dBi + 10log(2) = 6.09dBi
5. For WLAN 5GHz (U-NII-2C & U-NII-3): Directional gain = 4.76dBi + 10log(2) = 7.77dBi
6. For Bluetooth: Antenna gain: 3.62dBi

CONCLUSION:

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

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

CPD = Calculation power density

LPD = Limit of power density

Therefore, the worst-case situation is $0.07583 / 1 + 0.00687 / 1 = 0.0827$, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

--- END ---