RF Exposure Report

Report No.: SA190716E01

FCC ID: J9C-QCNFA524

Test Model: QCNFA524

Received Date: July 16, 2019

Test Date: Sep. 19 to Oct. 16, 2019

Issued Date: Nov. 08, 2019

Applicant: Qualcomm Technologies, Inc.

Address: 5775 Morehouse Drive, San Diego, CA 92121-1714

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, Taiwa.

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

FCC Registration / Designation Number: 723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
SA190716E01	Original release.	Nov. 08, 2019

1   Certificate of Conformity

Product: Wi-Fi 6 + BT 5.1 M.2 1216 Module

Brand: Qualcomm

Test Model: QCNFA524

Sample Status: ENGINEERING SAMPLE

Applicant: Qualcomm Technologies, Inc.

Test Date: Sep. 19 to Oct. 16, 2019

Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.3-2002

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:** _____ Nov. 08, 2019 _____

Wendy Wu / Specialist

Approved by : _____ , **Date:** _____ Nov. 08, 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/cm²)	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/f²)*	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 20 cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

Ant. No.	Brand	Model	Antenna Net gain	Frequency range (GHz)	Cable Loss (dBi)	Ant. Type	Connector Type	Cable Length (mm)
1	WNC	81.EBJ15.005	3.00	2.4~2.4835	1.15	PIFA	i-pex(MHF2)	300
			2.56	5.15~5.35	1.70			
			4.76	5.47~5.725	1.74			
			4.76	5.725~5.850	1.79			
2	WNC	81.EBJ15.005	3.62	2.4~2.4835	1.15	PIFA	i-pex(MHF2)	300
			3.08	5.15~5.35	1.70			
			3.31	5.47~5.725	1.74			
			2.42	5.725~5.850	1.79			

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

2.5 Calculation Result

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm²)	Limit (mW/cm²)
WLAN 2.4GHz	2412-2472	282.508	6.63	20	0.25868	1
WLAN U-NII-1	5180-5240	282.508	6.09	20	0.22843	1
WLAN U-NII-2A	5260-5320	282.508	6.09	20	0.22843	1
WLAN U-NII-2C	5500-5720	224.404	7.77	20	0.26715	1
WLAN U-NII-3	5745-5825	282.508	7.77	20	0.33633	1
Bluetooth (BT-EDR)	2402-2480	70.795	3.62	20	0.03241	1
Bluetooth (BT-LE)	2402-2480	7.079	3.62	20	0.00324	1

NOTE:
1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. 2.4GHz: Directional gain = 3.62dBi + 10log(2) = 6.63dBi
   5GHz:
   U-NII-1 & U-NII-2A: Directional gain = 3.08dBi + 10log(2) = 6.09dBi
   U-NII-2C & U-NII-3: Directional gain = 4.76dBi + 10log(2) = 7.77dBi
3. This power include tune-up tolerance range that specified in QCNFA524 Tune Up power table.

Conclusion:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)
2	WLAN (5GHz)	Bluetooth

WLAN 2.4GHz + WLAN 5GHz = 0.25868 / 1 + 0.33633 / 1 = 0.59501

WLAN 5GHz + Bluetooth = 0.33633 / 1 + 0.03241 / 1 = 0.36874

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

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