

RF Exposure Report

Report No.: SA201119E01

FCC ID: J9C-QCNFA765

Test Model: QCNFA765

Received Date: Nov. 19, 2020

Test Date: Mar. 30, 2021

Issued Date: Apr. 09, 2021

Applicant: Qualcomm Technologies, Inc.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
SA201119E01	Original release.	Apr. 09, 2021

1 Certificate of Conformity

Product: Wi-Fi 6E BT 5.2 M.2 2230 Module

Brand: Qualcomm

Test Model: QCNFA765

Sample Status: Engineering sample

Applicant: Qualcomm Technologies, Inc.

Test Date: Mar. 30, 2021

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 : Vivian Huang , **Date:** Apr. 09, 2021
Vivian Huang / Specialist

Approved by : Clark Lin , **Date:** Apr. 09, 2021
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 20 cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

Antenna Set	RF Chain No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range	Cable Loss (dB)	Antenna Type	Connector Type	Cable Length
1	Chain0/1	HONGBO	260-25094	3.53	2.4~2.4835 GHz	0.76	PIFA	i-pex(MHF 4L)	300mm
				3.06	5.15~5.25 GHz	1.16			
				3.07	5.25~5.35 GHz	1.18			
				4.81	5.47~5.725 GHz	1.2			
				4.2	5.725~5.850 GHz	1.27			
2	Chain0/1	HONGBO	260-25083	5.09	5.850~5.895 GHz	1.29	PIFA	i-pex(MHF 4L)	300mm
				5.14	5.925~6.425 GHz	1.32			
				5.09	6.425~6.525 GHz	1.35			
				5.16	6.525~6.875 GHz	1.4			
				5.12	6.875~7.125 GHz	1.45			
3	Chain0/1	HONGBO	260-25084	3.22	2.4~2.4835 GHz	0.5	Monopole	i-pex(MHF 4L)	200mm
				3.35	5.150~5.250 GHz	0.76			
				3.42	5.250~5.350 GHz	0.78			
				4.77	5.470~5.725 GHz	0.81			
				4.72	5.725~5.850 GHz	0.85			
				4.71	5.850~5.895 GHz	0.86			
				4.75	5.925~6.425 GHz	0.87			
				4.29	6.425~6.525 GHz	0.91			
				4.81	6.525~6.875 GHz	0.96			
4.74	6.875~7.125 GHz	0.98							

Note: The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

2.5 Calculation Result

Operation Mode	Max Avg. Power (dBm)	Max Avg. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WLAN 2.4GHz	24.50	281.838	6.54	20	0.25277	1
WLAN 5GHz	22.50	177.828	7.82	20	0.21416	1
WLAN 6GHz	22.50	177.828	8.17	20	0.23213	1
Bluetooth	16	39.811	3.53	20	0.01785	1

NOTE:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 2.4GHz: Directional gain = 3.53dBi + 10log(2) = 6.54dBi
 5GHz:
 U-NII-1: Directional gain = 3.35dBi + 10log(2) = 6.36dBi
 U-NII-2A: Directional gain = 3.42dBi + 10log(2) = 6.43dBi
 U-NII-2C: Directional gain = 4.81dBi + 10log(2) = 7.82dBi
 U-NII-3: Directional gain = 4.72dBi + 10log(2) = 7.73dBi
 6GHz:
 U-NII-5: Directional gain = 5.14dBi + 10log(2) = 8.15dBi
 U-NII-6: Directional gain = 5.09dBi + 10log(2) = 8.10dBi
 U-NII-7: Directional gain = 5.16dBi + 10log(2) = 8.17dBi
 U-NII-8: Directional gain = 5.12dBi + 10log(2) = 8.13dBi
- This power include tune-up tolerance range that specified in QCNFA765 Tune Up power table.
- BT-LE and BT-EDR can't transmit simultaneously.

Conclusion:

The formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Simultaneously transmission condition.

Condition	Technology	
1	WLAN(2.4GHz)	WLAN(6GHz)
2	WLAN(2.4GHz)	WLAN(5GHz)
3	WLAN(6GHz)	Bluetooth
4	WLAN(5GHz)	Bluetooth

$$\text{WLAN 2.4GHz} + \text{WLAN 6GHz} = 0.25277 / 1 + 0.23213 / 1 = 0.48490$$

$$\text{WLAN 2.4GHz} + \text{WLAN 5GHz} = 0.25277 / 1 + 0.21416 / 1 = 0.46693$$

$$\text{WLAN 6GHz} + \text{Bluetooth} = 0.23213 / 1 + 0.01785 / 1 = 0.24998$$

$$\text{WLAN 5GHz} + \text{Bluetooth} = 0.21416 / 1 + 0.01785 / 1 = 0.23201$$

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

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