



FCC RADIO TEST REPORT

FCC ID : PPD-QCNFA344AH
Equipment : 802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card
Brand Name : Qualcomm Atheros
Model Name : QCNFA344A
Applicant : Qualcomm Atheros, Inc.
1700 Technology Drive, San Jose, CA 95110
Manufacturer : Qualcomm Atheros, Inc.
1700 Technology Drive, San Jose, CA 95110
Standard : FCC Part 15 Subpart C §15.247

Equipment: Qualcomm Atheros QCNFA344A tested inside of Lenovo Notebook Computer.

The product was received on Jan. 09, 2020 and testing was started from Jan. 31, 2020 and completed on Jan. 31, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

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

The test results in this partial report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Reviewed by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan

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Appendix A. Conducted Test Results	



History of this test report

Report No.	Version	Description	Issued Date
FR010908-05A	01	Initial issue of report	Mar. 09, 2020

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(b)(1)	Peak Output Power	Pass	-
3.2	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Note: The test plan for power measurement is designated by manufacturer as worst case for Test Lab. measurement. Then, all test cases are performed, based on the worst power measured by Test Lab, and reported accordingly.

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Wii Chang

Report Producer: Amy Chen

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card
Brand Name	Qualcomm Atheros
Model Name	QCNFA344A
FCC ID	PPD-QCNFA344AH
Sample 1	EUT with Host 1
Sample 2	EUT with Host 2
EUT supports Radios application	WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE
EUT Stage	Production Unit

Remark:

- The above EUT's information was declared by manufacturer.
- Equipment: Qualcomm Atheros QCNFA344A tested inside of Lenovo Notebook Computer.

The product was installed into Notebook Computer (Brand Name: Lenovo, Model Name: IdeaPad Flex 5 14ARE05) during test, and the host information was recorded in the following table.

Host Information	
Host 1	Host with AWAN Antenna
Host 2	Host with High-Tek Antenna

Antenna Information													
Antenna 1	Manufacturer			AWAN			Antenna 2	Manufacturer			AWAN		
	Ant. Type			PIFA				Ant. Type			PIFA		
	Part Number			025.901MZ.0001				Part Number			025.901N0.0001		
	Min Freq.	Max Freq.	Peak Gain (dBi)	Min Freq.	Max Freq.	Peak Gain (dBi)		Min Freq.	Max Freq.	Peak Gain (dBi)	Min Freq.	Max Freq.	Peak Gain (dBi)
	2400 MHz	2483.5MHz	1.23	5470 MHz	5725 MHz	-3.97		2400 MHz	2483.5MHz	0.73	5470 MHz	5725 MHz	-2.16
	5150 MHz	5250 MHz	-0.12	5725 MHz	5850 MHz	-3.33		5150 MHz	5250 MHz	-0.88	5725 MHz	5850 MHz	-0.77
	5250 MHz	5350 MHz	-1.47					5250 MHz	5350 MHz	-0.9			
Antenna 1	Manufacturer			High-tek			Antenna 2	Manufacturer			High-tek		
	Ant. Type			PIFA				Ant. Type			PIFA		
	Part Number			025.901N3.0001				Part Number			025.901N4.0001		
	Min Freq.	Max Freq.	Peak Gain (dBi)	Min Freq.	Max Freq.	Peak Gain (dBi)		Min Freq.	Max Freq.	Peak Gain (dBi)	Min Freq.	Max Freq.	Peak Gain (dBi)
	2400 MHz	2483.5MHz	2.95	5470 MHz	5725 MHz	2.03		2400 MHz	2483.5 MHz	1.27	5470 MHz	5725 MHz	-0.76
	5150 MHz	5250 MHz	1.24	5725 MHz	5850 MHz	2.54		5150 MHz	5250 MHz	0.83	5725 MHz	5850 MHz	-0.06
	5250 MHz	5350 MHz	0.5					5250 MHz	5350 MHz	0.83			
Remark: All the tests were performed with “High-Tek Antenna” as representative.													

Remark: All the tests were performed with "High-Tek Antenna" as representative.

1.2 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth BR(1Mbps) : 7.73 dBm (0.0059 W) Bluetooth EDR (2Mbps) : 8.73 dBm (0.0075 W) Bluetooth EDR (3Mbps) : 9.00 dBm (0.0079 W)
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK

1.3 Modification of EUT

No modifications are made to the EUT during all test items.

1.4 Testing Location

Test Site	SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory
Test Site Location	No.52 , Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan
Test Site No.	Sporton Site No.
	TH05-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190

1.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- ♦ ANSI C63.10-2013

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	27	2429	54	2456
	1	2403	28	2430	55	2457
	2	2404	29	2431	56	2458
	3	2405	30	2432	57	2459
	4	2406	31	2433	58	2460
	5	2407	32	2434	59	2461
	6	2408	33	2435	60	2462
	7	2409	34	2436	61	2463
	8	2410	35	2437	62	2464
	9	2411	36	2438	63	2465
	10	2412	37	2439	64	2466
	11	2413	38	2440	65	2467
	12	2414	39	2441	66	2468
	13	2415	40	2442	67	2469
	14	2416	41	2443	68	2470
	15	2417	42	2444	69	2471
	16	2418	43	2445	70	2472
	17	2419	44	2446	71	2473
	18	2420	45	2447	72	2474
	19	2421	46	2448	73	2475
	20	2422	47	2449	74	2476
	21	2423	48	2450	75	2477
	22	2424	49	2451	76	2478
	23	2425	50	2452	77	2479
	24	2426	51	2453	78	2480
	25	2427	52	2454	-	-
	26	2428	53	2455	-	-

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

Summary table of Test Cases			
Test Item	Data Rate / Modulation		
	Bluetooth BR 1Mbps GFSK	Bluetooth EDR 2Mbps $\pi/4$ -DQPSK	Bluetooth EDR 3Mbps 8-DPSK
Conducted Test Cases	Mode 1: CH00_2402 MHz	Mode 4: CH00_2402 MHz	Mode 7: CH00_2402 MHz
	Mode 2: CH39_2441 MHz	Mode 5: CH39_2441 MHz	Mode 8: CH39_2441 MHz
	Mode 3: CH78_2480 MHz	Mode 6: CH78_2480 MHz	Mode 9: CH78_2480 MHz

2.3 EUT Operation Test Setup

The RF test items, utility "QCARCT_V3.0.169.0" was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

3 Test Result

3.1 Output Power Measurement

3.1.1 Limit of Output Power

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.

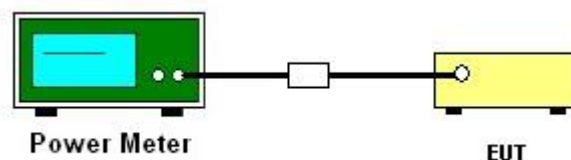
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
1. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Measure the conducted output power with cable loss and record the results in the test report.
4. Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.1.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.



3.2 Antenna Requirements

3.2.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.2.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.2.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H2	41410069	N/A	Jun. 17, 2019	Jan. 31, 2020	Jun. 16, 2020	Conducted (TH05-HY)
Power Meter	Agilent	E4416A	GB412923 44	N/A	Dec. 27, 2019	Jan. 31, 2020	Dec. 26, 2020	Conducted (TH05-HY)
Power Sensor	Agilent	E9327A	US404415 48	50MHz~18GHz	Dec. 27, 2019	Jan. 31, 2020	Dec. 26, 2020	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Jul. 15, 2019	Jan. 31, 2020	Jul. 14, 2020	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF-058	EC120838 2	N/A	Mar. 27, 2019	Jan. 31, 2020	Mar. 26, 2020	Conducted (TH05-HY)

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Kathy Chen	Temperature:	21~25	°C
Test Date:	2020/1/31	Relative Humidity:	51~54	%

TEST RESULTS DATA**Peak Power Table**

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH1	0	1	6.18	30.00	Pass
	39	1	7.67	30.00	Pass
	78	1	7.73	30.00	Pass
2DH1	0	1	7.55	20.97	Pass
	39	1	8.39	20.97	Pass
	78	1	8.73	20.97	Pass
3DH1	0	1	7.77	20.97	Pass
	39	1	8.63	20.97	Pass
	78	1	9.00	20.97	Pass

TEST RESULTS DATA**Average Power Table*****(Reporting Only)***

DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH1	0	1	5.23	5.21
	39	1	6.31	5.21
	78	1	6.88	5.21
2DH1	0	1	4.86	5.12
	39	1	5.95	5.12
	78	1	6.50	5.12
3DH1	0	1	4.89	5.13
	39	1	5.96	5.13
	78	1	6.53	5.13

————THE END————