

FCC RADIO TEST REPORT

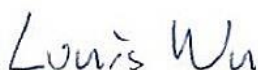
FCC ID : PPD-QCNFA344AH
Equipment : 802.11a/b/g/n/ac + BT 4.1 M.2 2230 Type Card
Brand Name : Qualcomm Atheros
Model Name : QCNFA344A
Applicant : Qualcomm Atheros, Inc.
1700 Technology Drive, San Jose, CA 95110
Manufacturer : Qualcomm Atheros, Inc.
1700 Technology Drive, San Jose, CA 95110
Standard :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



Approved by: Louis Wu

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

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

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History of this test report

| Report No. | Version | Description | Issued Date |
|--------------|---------|-------------------------|---------------|
| FR010908-05B | 01 | Initial issue of report | Mar. 09, 2020 |
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Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---------------|--------------------|---------------------|--------------------|--------|
| 3.1 | 15.247(b)(3) | 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. | | | | | | | | | | | | | |

1.2 Product Specification of Equipment Under Test

| Standards-related Product Specification | |
|---|---|
| Tx/Rx Frequency Range | 2402 MHz ~ 2480 MHz |
| Number of Channels | 40 |
| Carrier Frequency of Each Channel | 40 Channel (37 hopping + 3 advertising channel) |
| Average Power to Antenna | 3.00 dBm (0.0020 W) |
| Type of Modulation | Bluetooth LE : GFSK |

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) |
|-----------------|---------|----------------|---------|----------------|
| 2400-2483.5 MHz | 0 | 2402 | 21 | 2444 |
| | 1 | 2404 | 22 | 2446 |
| | 2 | 2406 | 23 | 2448 |
| | 3 | 2408 | 24 | 2450 |
| | 4 | 2410 | 25 | 2452 |
| | 5 | 2412 | 26 | 2454 |
| | 6 | 2414 | 27 | 2456 |
| | 7 | 2416 | 28 | 2458 |
| | 8 | 2418 | 29 | 2460 |
| | 9 | 2420 | 30 | 2462 |
| | 10 | 2422 | 31 | 2464 |
| | 11 | 2424 | 32 | 2466 |
| | 12 | 2426 | 33 | 2468 |
| | 13 | 2428 | 34 | 2470 |
| | 14 | 2430 | 35 | 2472 |
| | 15 | 2432 | 36 | 2474 |
| | 16 | 2434 | 37 | 2476 |
| | 17 | 2436 | 38 | 2478 |
| | 18 | 2438 | 39 | 2480 |
| | 19 | 2440 | - | - |
| | 20 | 2442 | - | - |

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 – LE / GFSK |
| Conducted Test Cases | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps |
| | Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps |
| | Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps |

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

For systems using digital modulation in the 2400-2483.5MHz, the limit for average output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the average output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

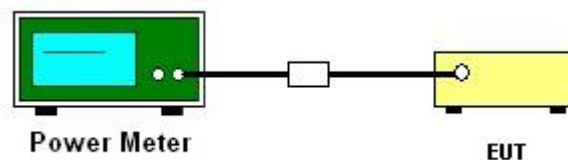
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT was connected to the power meter by RF cable and attenuator.
3. The path loss was compensated to the results for each measurement.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Measure the conducted output power and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of Average Output Power

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 Sensor | DARE | RPR3006W | 16I00054S NO10 | 10MHz~6GHz | Dec. 23, 2019 | Jan. 31, 2020 | Dec. 22, 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
Average Power Table
(Reporting Only)

| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Average Conducted Power (dBm) |
|------|-----------|-----|-----|-------------|-------------------------------|
| BLE | 1Mbps | 1 | 0 | 2402 | 2.30 |
| BLE | 1Mbps | 1 | 19 | 2440 | 2.80 |
| BLE | 1Mbps | 1 | 39 | 2480 | 3.00 |

————THE END————