

## FCC Test Report (BT-EDR)

**Report No.:** RF180816E04I-2

**FCC ID:** TX2-RTL8822CE

**Test Model:** RTL8822CE

**Received Date:** Sep. 16, 2019

**Test Date:** Sep. 19 to Oct. 04, 2019

**Issued Date:** Oct. 17, 2019

**Applicant:** Realtek Semiconductor Corp.

**Address:** No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan

**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



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### Release Control Record

| Issue No.      | Description       | Date Issued   |
|----------------|-------------------|---------------|
| RF180816E04I-2 | Original release. | Oct. 17, 2019 |

## 1 Certificate of Conformity

**Product:** 802.11a/b/g/n/ac RTL8822CE Combo module

**Brand:** Realtek

**Test Model:** RTL8822CE

**Sample Status:** ENGINEERING SAMPLE

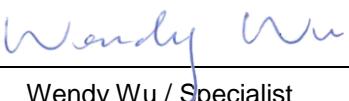
**Applicant:** Realtek Semiconductor Corp.

**Test Date:** Sep. 19 to Oct. 04, 2019

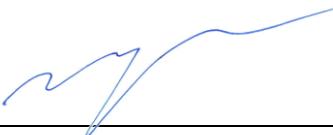
**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)

ANSI C63.10: 2013

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. 17, 2019

Wendy Wu / Specialist

**Approved by :**  , **Date:** Oct. 17, 2019

May Chen / Manager

## 2 Summary of Test Results

| 47 CFR FCC Part 15, Subpart C (Section 15.247) |                            |        |                                |
|--|----------------------------|--------|--------------------------------|
| FCC Clause                                     | Test Item                  | Result | Remarks                        |
| 15.247(b)                                      | Maximum Peak Output Power  | PASS   | Meet the requirement of limit. |
| -  | 20dB Bandwidth Measurement | -      | Reference only.                |

Note:

1. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. This report is supplementary report.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

| Measurement         | Frequency | Expanded Uncertainty (k=2) (±) |
|---------------------|-----------|--------------------------------|
| Conducted Emissions | -         | 3.1 dB                         |

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT (BT-EDR)

|                       |   |
|-----------------------|---|
| Product               | 802.11a/b/g/n/ac RTL8822CE Combo module |
| Brand                 | Realtek                                 |
| Test Model            | RTL8822CE                               |
| Status of EUT         | ENGINEERING SAMPLE                      |
| Power Supply Rating   | DC 3.3V from host equipment             |
| Modulation Type       | GFSK, $\pi/4$ -DQPSK, 8DPSK             |
| Modulation Technology | FHSS                                    |
| Transfer Rate         | Up to 3Mbps                             |
| Operating Frequency   | 2402MHz ~ 2480MHz                       |
| Number of Channel     | 79                                      |
| Output Power          | 9.419mW                                 |
| Antenna Type          | Refer to Note                           |
| Antenna Connector     | Refer to Note                           |
| Accessory Device      | NA                                      |
| Data Cable Supplied   | NA                                      |

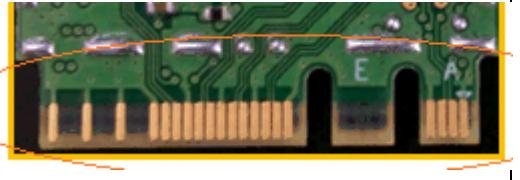
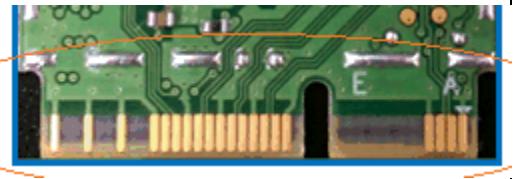
Note:

1. This report is prepared for FCC class II permissive change. The difference compared with the Report No.: RF180816E04-2 as the following:
  - ◆ Reduce power from 13dBm to 6.5~7dBm.
2. According to above conditions, only Conducted power and Bandwidth need to be performed. And all data were verified to meet the requirements.
3. There are WLAN and Bluetooth technology used for the EUT.
4. The EUT has four SKUs, please refer to the following table:

| SKU | Ant Port | Interface          |
|-----|----------|--------------------|
| A   | Tri      | PCI-E with A+E key |
| B   | Tri      | PCI-E with E key   |
| C   | Dual     | PCI-E with A+E key |
| D   | Dual     | PCI-E with E key   |

Note: From the above SKUs, SKU: A was selected as representative model for the test and its data was recorded in this report.

5. The EUT has two interfaces. The main difference is interface, but RF is the same. Please refer to the following table:

| Interface          | Photo  | Difference                     |
|--------------------|--|--------------------------------|
| PCI-E with A+E key |  |                                |
| PCI-E with E key   |  | Interface<br>(RF is the same.) |

6. Simultaneously transmission condition (only for SKU A, B).

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

**Note:** The emission of the simultaneous operation has been evaluated and no non-compliance was found.

7. The EUT has dual antenna and tri antenna, please refer to the following table:

| Dual antenna   |
|--|
| CON1+CON2  |
| ➤ 2X2 WIFI Antenna port: CON1 & CON2   |
| ➤ 1X1 BT Antenna port: CON1  |
| ➤ WiFi/BT used Time-division duplex function at CON1, so WiFi/BT not transmitter simultaneous at CON1.                 |
| Tri antenna  |
| CON1+CON2+CON3   |
| ➤ 2X2 WIFI Antenna port: CON1 & CON2   |
| ➤ 1X1 BT Antenna port: CON3 or CON1  |
| ➤ If BT function at CON1, WiFi/BT used Time-division duplex function, so WiFi/BT not transmitter simultaneous at CON1. |
| ➤ If BT function at CON3, WiFi/BT can transmitter simultaneous for BT at CON 3 and WiFi at CON1 & CON2.                |

8. The antennas provided to the EUT, please refer to the following table:

| Antenna No. | CON No. | Brand   | Model                    | Ant. Net Gain (dBi) | Frequency range (GHz) | Antenna Type | Connector Type |
|-------------|---------|---------|--------------------------|---------------------|-----------------------|--------------|----------------|
| 1           | CON1    | LYNwave | ALA110-222050<br>-300011 | 3.5                 | 2.4~2.4835            | PIFA         | i-pex(MHF)     |
|             | CON2    |         |                          | 5                   | 5.15~5.85             | PIFA         | i-pex(MHF)     |
| 2           | CON1    | PSA     | RFDPA171320E<br>MLB301   | 3.14                | 2.4~2.4835            | Dipole       | i-pex(MHF)     |
|             | CON2    |         |                          | 5                   | 5.15~5.85             | Dipole       | i-pex(MHF)     |

9. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

### 3.2 Description of Test Modes

79 channels are provided for BT-EDR mode:

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

### 3.2.1 Test Mode Applicability and Tested Channel Detail

| EUT<br>CONFIGURE<br>MODE | APPLICABLE TO | DESCRIPTION |
|--------------------------|---------------|-------------|
|                          | APCM          |             |
|                          | ✓             |             |

Where **APCM**: Antenna Port Conducted Measurement

#### Antenna Port Conducted Measurement:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

| CON 1 Mode        |                |                       |                 |             |
|-------------------|----------------|-----------------------|-----------------|-------------|
| AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TECHNOLOGY | MODULATION TYPE | PACKET TYPE |
| 0 to 78           | 0, 39, 78      | FHSS                  | GFSK            | DH5         |
| 0 to 78           | 0, 39, 78      | FHSS                  | 8DPSK           | 3DH5        |

#### Test Condition:

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER (SYSTEM) | TESTED BY     |
|---------------|--------------------------|----------------------|---------------|
| APCM          | 25deg. C, 60%RH          | 120Vac, 60Hz         | Anderson Chen |

### **3.3 General Description of Applied Standards**

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C (15.247)**

**KDB 558074 D01 15.247 Meas Guidance v05r02**

**ANSI C63.10-2013**

All test items have been performed and recorded as per the above standards.

## 4 Test Types and Results

### 4.1 Channel Bandwidth

#### 4.1.1 Limits of Channel Bandwidth Measurement

For frequency hopping system operating in the 2400-2483.5MHz, If the 20dB bandwidth of hopping channel is greater than 25kHz, two-thirds 20dB bandwidth of hopping channel shall be a minimum limit for the hopping channel separation.

#### 4.1.2 Test Setup



#### 4.1.3 Test Instruments

| DESCRIPTION & MANUFACTURER        | MODEL NO.  | SERIAL NO.    | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------|------------|---------------|-----------------|------------------|
| Spectrum Analyzer<br>R&S          | FSV40      | 100964        | June 04, 2019   | June 03, 2020    |
| Fixed Attenuator<br>Mini-Circuits | MDCS18N-10 | MDCS18N-10-01 | Apr. 15, 2019   | Apr. 14, 2020    |

**NOTE:** 1. The test was performed in Oven room 2.  
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.  
 3. Tested Date: Sep. 19 to Oct. 04, 2019

#### 4.1.4 Test Procedure

- Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- Detector = peak.
- Repeat above procedures until all frequencies measured were complete.

#### 4.1.5 Deviation from Test Standard

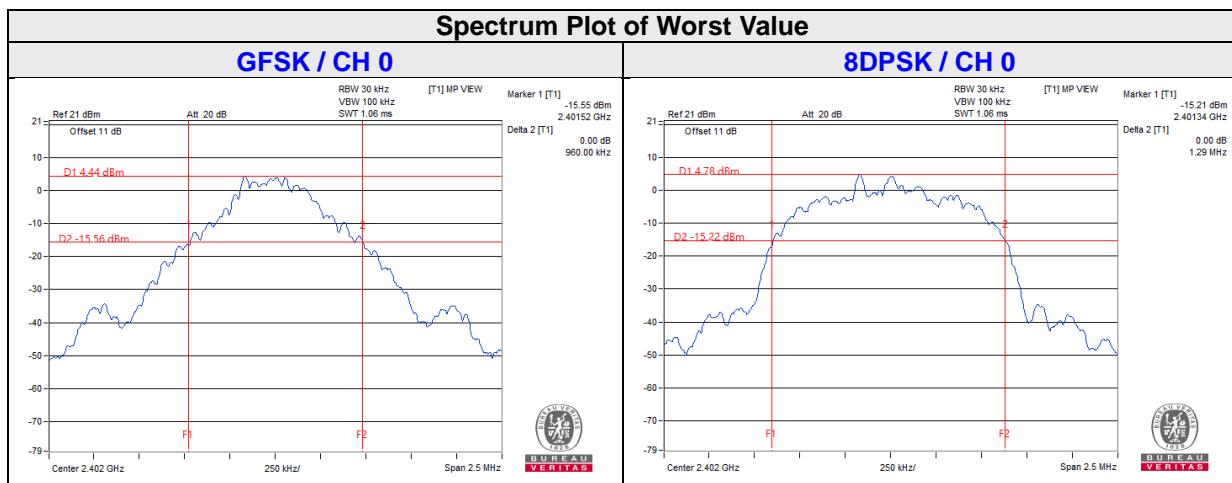
No deviation.

#### 4.1.6 EUT Operating Condition

The software (Bluetooth RF test tool (5.2.1.21)) provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

#### 4.1.7 Test Results

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) |       |
|---------|-----------------|----------------------|-------|
|         |                 | GFSK                 | 8DPSK |
| 0       | 2402            | 0.96                 | 1.29  |
| 39      | 2441            | 0.95                 | 1.29  |
| 78      | 2480            | 0.96                 | 1.29  |

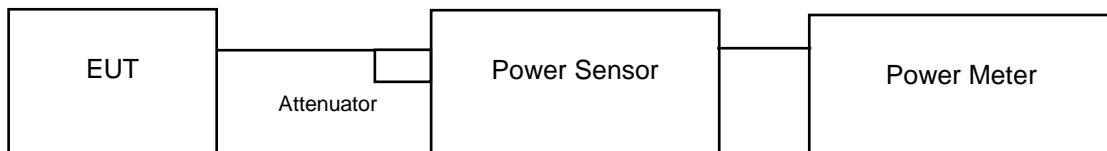


## 4.2 Maximum Output Power

### 4.2.1 Limits of Maximum Output Power Measurement

The Maximum Output Power Measurement is 125mW.

### 4.2.2 Test Setup



### 4.2.3 Test Instruments

| DESCRIPTION & MANUFACTURER        | MODEL NO.  | SERIAL NO.    | CALIBRATED DATE | CALIBRATED UNTIL |
|-----------------------------------|------------|---------------|-----------------|------------------|
| Power meter<br>Anritsu            | ML2495A    | 1014008       | May 13, 2019    | May 12, 2020     |
| Power sensor<br>Anritsu           | MA2411B    | 0917122       | May 13, 2019    | May 12, 2020     |
| Fixed Attenuator<br>Mini-Circuits | MDCS18N-10 | MDCS18N-10-01 | Apr. 15, 2019   | Apr. 14, 2020    |

**NOTE:**

1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: Sep. 19 to Oct. 04, 2019

### 4.2.4 Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

### 4.2.5 Deviation from Test Standard

No deviation.

### 4.2.6 EUT Operating Condition

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

## 4.2.7 Test Results

**FOR PEAK POWER**

| Channel | Frequency<br>(MHz) | GFSK                    |                          | 8DPSK                   |                          | Power<br>Limit (mW) | Pass / Fail |
|---------|--------------------|-------------------------|--------------------------|-------------------------|--------------------------|---------------------|-------------|
|         |                    | Output<br>Power<br>(mW) | Output<br>Power<br>(dBm) | Output<br>Power<br>(mW) | Output<br>Power<br>(dBm) |                     |             |
| 0       | 2402               | 4.989                   | 6.98                     | 9.419                   | 9.74                     | 125                 | Pass        |
| 39      | 2441               | 4.966                   | 6.96                     | 9.204                   | 9.64                     | 125                 | Pass        |
| 78      | 2480               | 4.92                    | 6.92                     | 9.12                    | 9.60                     | 125                 | Pass        |

**FOR AVERAGE POWER**

| Channel | Frequency<br>(MHz) | GFSK                  |                        | 8DPSK                 |                        |
|---------|--------------------|-----------------------|------------------------|-----------------------|------------------------|
|         |                    | Average Power<br>(mW) | Average Power<br>(dBm) | Average Power<br>(mW) | Average Power<br>(dBm) |
| 0       | 2402               | 4.875                 | 6.88                   | 4.842                 | 6.85                   |
| 39      | 2441               | 4.831                 | 6.84                   | 4.721                 | 6.74                   |
| 78      | 2480               | 4.775                 | 6.79                   | 4.656                 | 6.68                   |

## Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

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