

RF EXPOSURE REPORT

CERTIFICATE OF CONFORMITY

FCC Rule Part: FCC Part 2 (Section 2.1091)

Report No.: MFBBUI-WTW-P23070201

FCC ID: TX2-RTL8922AE

Product: 11be RTL8922AE Combo module

Brand: REALTEK

Model No.: RTL8922AE

Received Date: 2023/6/27

Test Date: 2023/9/6 ~ 2023/9/18

Issued Date: 2023/12/1

Applicant: Realtek Semiconductor Corp.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

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

FCC Registration / 20331 / TW2022

Designation Number:

Approved by: _____



Date: _____

2023/12/1

Wen Yu / Assistant Manager

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Prepared by : Phoenix Huang / Specialist

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Release Control Record

Issue No.	Description	Date Issued
MFBBUI-WTW-P23070201	Original release.	2023/12/1

1 Certificate

Product: 11be RTL8922AE Combo module

Brand: REALTEK

Test Model: RTL8922AE

Sample Status: Engineering sample

Applicant: Realtek Semiconductor Corp.

Test Date: 2023/9/6 ~ 2023/9/18

FCC Rule Part: FCC Part 2 (Section 2.1091)

Standard: KDB 447498 D04 Interim General RF Exposure Guidance v01

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 RF characteristics under the conditions specified in this report.

2 Applicable RF Exposure Limit

§ 1.1310 Radiofrequency radiation exposure limits.

(a) Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b) of this part within the frequency range of 100 kHz to 6 GHz (inclusive).

(b) The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.

(c) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

(e) Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields

➤ Limits for General Population/Uncontrolled Exposure

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.

➤ Limits for Occupational/Controlled Exposure

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				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6

f = frequency in MHz. * = Plane-wave equivalent power density.

MPE-based Exemption – §1.1307(b)(3)(i)(C)

- The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power.
- Table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits.

RF Source frequency (MHz)	Minimum Distance		Threshold ERP (watts)
	$\lambda_L / 2\pi$	$\lambda_H / 2\pi$	
0.3-1.34	159 m–35.6 m		$1,920 R^2$.
1.34-30	35.6 m–1.6 m		$3,450 R^2/f^2$.
30-300	1.6 m–159 mm		$3.83 R^2$.
300-1,500	159 mm–31.8 mm		$0.0128 R^2f$.
1,500-100,000	31.8 mm–0.5 mm		$19.2 R^2$.
R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters.			

MPE-based Exemption – §1.1307(b)(3)(i)(B)

- For mobile devices that are not exempt per Table 1 of §1.1307(b)(1)(i)(C) and device at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power.

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

Fixed RF sources operating in the same time-averaging period – §1.1307(b)(3)(ii)(B)

- Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (Evaluated_k term) should be used to determine exemption for simultaneous transmission according to Formula below,

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE should be less than 1, to determine simultaneous transmission exposure compliance.

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using [paragraph \(b\)\(3\)\(i\)\(B\)](#) of this section for P_{th} , including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

$P_{th,i}$ = the exemption threshold power (P_{th}) according to [paragraph \(b\)\(3\)\(i\)\(B\)](#) of this section for fixed, mobile, or portable RF source i .

$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$ according to the applicable formula of [paragraph \(b\)\(3\)\(i\)\(C\)](#) of this section.

$Exposure Limit_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k , as applicable from [§ 1.1310 of this chapter](#).

b = number of fixed, mobile, or portable RF sources claiming exemption using [paragraph \(b\)\(3\)\(i\)\(C\)](#) of this section for Threshold ERP, including existing exempt transmitters and those being added.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

ERP_j = the ERP of fixed, mobile, or portable RF source j .

$Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

3 Test Results

For 1Tx

Environmental Conditions:	25°C, 60% RH	Tested By:	Katina Lu
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For Single RF Source

MPE-based Exemption §1.1307(b)(3)(i)(C)							
Operation Mode	Frequency Band (MHz)	Average Power (mW)	Antenna Gain (dBi)	Maximum ERP (mW)	Distance (cm)	Limit Threshold (mW)	Test Result
Bluetooth	2402-2480	19.32	3.4	25.764	20	768	Pass
WLAN 2.4 GHz	2412-2472	184.077	3.4	245.471	20	768	Pass
WLAN 5 GHz(H)	5500-5825	176.604	5	340.409	20	768	Pass
WLAN 5 GHz(L)	5180-5320	176.198	5	339.626	20	768	Pass
WLAN 5.9 GHz	5815-5885	175.388	5	338.065	20	768	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	172.982	5	333.427	20	768	Pass

Simultaneously transmission conditions

Condition	Technology	
	S0 (Chain 1)	S1 (Chain 0)
1	WLAN (5 GHz)_H	Bluetooth + WLAN (5 GHz)_L
2	WLAN (5 GHz)_L	Bluetooth + WLAN (5 GHz)_H
3	WLAN (5 GHz)_L	Bluetooth + WLAN (6 GHz)
4	WLAN (6 GHz)	Bluetooth + WLAN (5 GHz)_L
5	WLAN (6 GHz)	Bluetooth + WLAN (5 GHz)_H
6	WLAN (5 GHz)_H	Bluetooth + WLAN (6 GHz)
7	WLAN (2.4 GHz)	WLAN (5 GHz) Full
8	WLAN (2.4 GHz)	WLAN (6 GHz)
9	WLAN (5 GHz) Full	Bluetooth
10	WLAN (6 GHz)	Bluetooth

For Multiple RF Sources (Simultaneous Operations Condition 1)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.919	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	340.409	768	0.443			
WLAN 5 GHz(L)	5180-5320	339.626	768	0.442			

For Multiple RF Sources (Simultaneous Operations Condition 2)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.919	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	340.409	768	0.443			
WLAN 5 GHz(L)	5180-5320	339.626	768	0.442			

For Multiple RF Sources (Simultaneous Operations Condition 3)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.91	1	Pass
WLAN 5 GHz(L)	5180-5320	339.626	768	0.442			
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	333.427	768	0.434			

For Multiple RF Sources (Simultaneous Operations Condition 4)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.91	1	Pass
WLAN 5 GHz(L)	5180-5320	339.626	768	0.442			
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	333.427	768	0.434			

For Multiple RF Sources (Simultaneous Operations Condition 5)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.911	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	340.409	768	0.443			
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	333.427	768	0.434			

For Multiple RF Sources (Simultaneous Operations Condition 6)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.911	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	340.409	768	0.443			
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	333.427	768	0.434			

For Multiple RF Sources (Simultaneous Operations Condition 7)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
WLAN 2.4 GHz	2412-2472	245.471	768	0.32	0.763	1	Pass
WLAN 5 GHz(F)	5180-5320 5500-5825 5815-5885	340.409	768	0.443			

For Multiple RF Sources (Simultaneous Operations Condition 8)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
WLAN 2.4 GHz	2412-2472	245.471	768	0.32	0.754	1	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	333.427	768	0.434			

For Multiple RF Sources (Simultaneous Operations Condition 9)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.477	1	Pass
WLAN 5 GHz(F)	5180-5320 5500-5825 5815-5885	340.409	768	0.443			

For Multiple RF Sources (Simultaneous Operations Condition 10)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.468	1	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	333.427	768	0.434			

For 2Tx

Environmental Conditions:	25°C, 60% RH	Tested By:	Katina Lu
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CDD Mode
For Single RF Source

MPE-based Exemption §1.1307(b)(3)(i)(C)							
Operation Mode	Frequency Band (MHz)	Average Power (mW)	Antenna Gain (dBi)	Maximum ERP (mW)	Distance (cm)	Limit Threshold (mW)	Test Result
Bluetooth	2402-2480	19.32	3.4	25.764	20	768	Pass
WLAN 2.4 GHz	2412-2472	371.145	3.4	494.93	20	768	Pass
WLAN 5 GHz(H)	5500-5825	343.329	5	661.775	20	768	Pass
WLAN 5 GHz(L)	5180-5320	154.201	5	297.226	20	768	Pass
WLAN 5.9 GHz	5815-5885	173.612	5	334.641	20	768	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	299.66	5	577.602	20	768	Pass

Simultaneously transmission conditions

Condition	Technology
1	WLAN (5 GHz)_L + Bluetooth
2	WLAN (5 GHz)_H + Bluetooth
3	WLAN (6 GHz) + Bluetooth

For Multiple RF Sources (Simultaneous Operations Condition 1)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.421	1	Pass
WLAN 5 GHz(L)	5180-5320	297.226	768	0.387			

For Multiple RF Sources (Simultaneous Operations Condition 2)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.896	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	661.775	768	0.862			

For Multiple RF Sources (Simultaneous Operations Condition 3)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.786	1	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	577.602	768	0.752			

Beamforming Mode

For Single RF Source

MPE-based Exemption §1.1307(b)(3)(i)(C)							
Operation Mode	Frequency Band (MHz)	Average Power (mW)	Antenna Gain (dBi)	Maximum ERP (mW)	Distance (cm)	Limit Threshold (mW)	Test Result
Bluetooth	2402-2480	19.32	3.4	25.764	20	768	Pass
WLAN 5 GHz(L)	5180-5320	154.201	8.01	594.411	20	768	Pass
WLAN 5.9 GHz	5815-5885	153.833	8.01	592.993	20	768	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	149.129	8.01	574.86	20	768	Pass

MPE-based Exemption §1.1307(b)(3)(i)(B)							
Operation Mode	Frequency Band (MHz)	Average Power (mW)	Antenna Gain (dBi)	Maximum ERP (mW)	Distance (cm)	Limit Threshold (mW)	Test Result
WLAN 2.4 GHz	2412-2472	371.145	6.41	989.791	20	3060	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	335.748	8.01	1294.236	20	3060	Pass

Simultaneously transmission conditions

Condition	Technology
1	WLAN (5 GHz)_L + Bluetooth
2	WLAN (5 GHz)_H + Bluetooth
3	WLAN (6 GHz) + Bluetooth

For Multiple RF Sources (Simultaneous Operations Condition 1)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.808	1	Pass
WLAN 5 GHz(L)	5180-5320	594.411	768	0.774			

For Multiple RF Sources (Simultaneous Operations Condition 2)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.457	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	1294.236	3060	0.423			

For Multiple RF Sources (Simultaneous Operations Condition 3)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
Bluetooth	2402-2480	25.764	768	0.034	0.783	1	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	574.86	768	0.749			

4 Conclusion

Source-base time average power is below Exemption Criteria and/or Routine Evaluation MPE thresholds, therefore the device is compliant FCC RF exposure requirement.

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

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