RF EXPOSURE REPORT

CERTIFICATE OF CONFORMITY

FCC Rule Part:	**FCC Part 2 (Section 2.1091)**
Report No.:	MFBBUI-WTW-P23070201B
FCC ID:	TX2-RTL8922AE
Product:	11be RTL8922AE Combo module
Brand:	REALTEK
Model No.:	RTL8922AE
Received Date:	2024/1/26
Test Date:	2024/4/12
Issued Date:	2024/5/8
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

Approved by: _____ , **Date:** **2024/5/8**

Wen Yu / Assistant Manager

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Prepared by : Vito Lung / Specialist

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Release Control Record

Issue No.	Description	Date Issued
MFBBUI-WTW-P23070201B	Original release.	2024/5/8

1 Certificate

Product:	11be RTL8922AE Combo module
Brand:	REALTEK
Test Model:	RTL8922AE
Sample Status:	Engineering sample
Applicant:	Realtek Semiconductor Corp.
Test Date:	2024/4/12
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
300-1,500	…	…	f/1500	<30
1,500-100,000	…	…	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.

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

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 (Evaluatedk term) should be used to determine exemption for simultaneous transmission according to Formula below,

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

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

Environmental Conditions:	22°C, 57% RH	Tested By:	John Peng

For 1Tx

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	18.75	3.4	25.004	20	768	Pass
WLAN 2.4 GHz	2412-2472	172.584	3.4	230.144	20	768	Pass
WLAN 5 GHz(H)	5500-5825	174.181	5	335.738	20	768	Pass
WLAN 5 GHz(L)	5150-5320	172.982	5	333.427	20	768	Pass
WLAN 5.9 GHz	5815-5885	171.396	5	330.37	20	768	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	172.187	5	331.895	20	768	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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	25.004	768	0.033	0.904	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	335.738	768	0.437			
WLAN 5 GHz(L)	5150-5320	333.427	768	0.434			

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	25.004	768	0.033	0.904	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	335.738	768	0.437			
WLAN 5 GHz(L)	5150-5320	333.427	768	0.434			

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	25.004	768	0.033	0.899	1	Pass
WLAN 5 GHz(L)	5150-5320	333.427	768	0.434			
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	331.895	768	0.432			

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	25.004	768	0.033	0.899	1	Pass
WLAN 5 GHz(L)	5150-5320	333.427	768	0.434			
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	331.895	768	0.432			

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	25.004	768	0.033	0.902	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	335.738	768	0.437			
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	331.895	768	0.432			

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	25.004	768	0.033	0.902	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	335.738	768	0.437			
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	331.895	768	0.432			

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	230.144	768	0.3	0.737	1	Pass
WLAN 5 GHz(F)	5180-5320 5500-5825 5815-5885	335.738	768	0.437			

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	230.144	768	0.3	0.732	1	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	331.895	768	0.432			

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	25.004	768	0.033	0.47	1	Pass
WLAN 5 GHz(F)	5180-5320 5500-5825 5815-5885	335.738	768	0.437			

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	25.004	768	0.033	0.465	1	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	331.895	768	0.432			

Environmental Conditions:	22°C, 57% RH	Tested By:	John Peng

For 2Tx

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	18.75	3.4	25.004	20	768	Pass
WLAN 2.4 GHz	2412-2472	348.376	3.4	464.567	20	768	Pass
WLAN 5 GHz(H)	5500-5825	337.287	5	650.129	20	768	Pass
WLAN 5 GHz(L)	5150-5320	151.356	5	291.742	20	768	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	308.002	5	593.682	20	768	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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	25.004	768	0.033	0.413	1	Pass
WLAN 5 GHz(L)	5150-5320	291.742	768	0.38			

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	25.004	768	0.033	0.88	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	650.129	768	0.847			

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	25.004	768	0.033	0.806	1	Pass
WLAN 6 GHz	5955-6415 6435-6525 6535-6865 6875-7115	593.682	768	0.773			

Beamforming Mode

For Single RF Source

Environmental Conditions:	22°C, 57% RH	Tested By:	John Peng

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	18.75	3.4	25.004	20	768	Pass
WLAN 5 GHz(L)	5150-5320	151.356	8.01	583.445	20	768	Pass
WLAN 5.9 GHz	5815-5885	150.678	8.01	580.831	20	768	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

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	348.376	6.41	929.07	20	3060	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	331.894	8.01	1279.38	20	3060	Pass

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Simultaneously transmission conditions

Condition	Technology
1	WLAN (5 GHz)_L + Bluetooth
2	WLAN (5 GHz)_H + 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	25.004	768	0.033	0.793	1	Pass
WLAN 5 GHz(L)	5150-5320	583.445	768	0.76			

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	25.004	768	0.033	0.451	1	Pass
WLAN 5 GHz(H)	5500-5825 5815-5885	1279.38	3060	0.418			

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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