

TEST REPORT

of

FCC CFR 47 part 1, 1.1307(b), 1.1310

FCC ID: 2ADQJ-Y89359

Equipment Under Test : WiFi/BT Combo Module

Model Name : BWR-Y89359SMA

Variant Model Name(s) : -

Applicant : ESSYS CO.,LTD

Manufacturer : ESSYS CO.,LTD

Date of Receipt : 2022.03.14

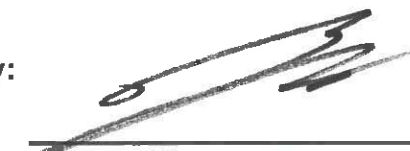
Date of Test(s) : 2022.03.28 ~ 2022.05.18

Date of Issue : 2022.05.19

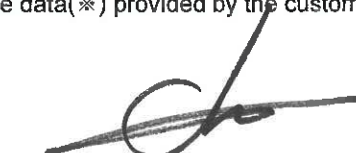
In the configuration tested, the EUT complied with the standards specified above. This test report does not assure KOLAS accreditation.

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Tested by:


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Report Number: F690501-RF-RTL003140

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1. General Information

1.1. Testing Laboratory

SGS Korea Co., Ltd. (Gunpo Laboratory)

- 10-2, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- 4, LS-ro 182beon-gil, Gunpo-si, Gyeonggi-do, Korea, 15807
- Designation number: KR0150

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1.2. Details of Applicant

Applicant : ESSYS CO.,LTD
Address : 55, Gaetbeol-ro, Yeonsu-gu, Incheon, Republic of Korea
Contact Person : Sung-hoon, Kim
Phone No. : +82 32 215 0923

1.3. Details of Manufacturer

Company : Same as applicant
Address : Same as applicant

1.4. Description of EUT

Kind of Product	WiFi/BT Combo Module
Model Name	BWR-Y89359SMA
Variant Model Name	-
Power Supply	DC 3.3 V
Frequency Range	2 402 MHz ~ 2 480 MHz (Bluetooth) 2 412 MHz ~ 2 462 MHz (11b/g/n_HT20) 5 180 MHz ~ 5 240 MHz (Band 1: 11a/n_HT20, 11ac_VHT20) 5 190 MHz ~ 5 230 MHz (Band 1: 11n_HT40, 11ac_VHT40) 5 210 MHz (Band 1: 11ac_VHT80) 5 260 MHz ~ 5 320 MHz (Band 2A: 11a/n_HT20, 11ac_VHT20) 5 270 MHz ~ 5 310 MHz (Band 2A: 11n_HT40, 11ac_VHT40) 5 290 MHz (Band 2A: 11ac_VHT80) 5 500 MHz ~ 5 720 MHz (Band 2C: 11a/n_HT20, 11ac_VHT20) 5 510 MHz ~ 5 710 MHz (Band 2C: 11n_HT40, 11ac_VHT40) 5 530 MHz ~ 5 690 MHz (Band 2C: 11ac_VHT80) 5 745 MHz ~ 5 825 MHz (Band 3: 11a/n_HT20, 11ac_VHT20) 5 755 MHz ~ 5 795 MHz (Band 3: 11n_HT40, 11ac_VHT40) 5 775 MHz (Band 3: 11ac_VHT80)
Modulation Technique	DSSS, OFDM, GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels	79 channels (Bluetooth) 11 channels (11b/g/n_HT20) 4 channels (Band 1: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 1: 11n_HT40, 11ac_VHT40) 1 channel (Band 1: 11ac_VHT80) 4 channels (Band 2A: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 2A: 11n_HT40, 11ac_VHT40) 1 channel (Band 2A: 11ac_VHT80) 9 channels (Band 2C: 11a/n_HT20, 11ac_VHT20) 4 channels (Band 2C: 11n_HT40, 11ac_VHT40) 2 channels (Band 2C: 11ac_VHT80) 5 channels (Band 3: 11a/n_HT20, 11ac_VHT20) 2 channels (Band 3: 11n_HT40, 11ac_VHT40) 1 channel (Band 3: 11ac_VHT80)
Antenna Type	Pattern antenna
Antenna Gain[※]	2 400 MHz ~ 2 483.5 MHz: 3.36 dBi (Bluetooth) 2 400 MHz ~ 2 483.5 MHz: 1.22 dBi (WLAN 2.4 G) 5 150 MHz ~ 5 250 MHz: 3.49 dBi (WLAN 5 G) 5 250 MHz ~ 5 350 MHz: 3.98 dBi (WLAN 5 G) 5 470 MHz ~ 5 725 MHz: 4.83 dBi (WLAN 5 G) 5 725 MHz ~ 5 850 MHz: 2.30 dBi (WLAN 5 G)
H/W Version	1.0
S/W Version	1.0

1.5. Test Report Revision

Revision	Report Number	Date of Issue	Description
0	F690501-RF-RTL003140	2022.05.19	Initial

2. RF Exposure Evaluation

2.1. Environmental evaluation and exposure limit according to FCC CFR 47 part 1, 1.1307(b), 1.1310

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time
(A) Limits for Occupational/Controlled 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
(ii) 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
<u>1 500-100 000</u>	-	-	<u>1.0</u>	<u><30</u>

2.1.1. Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

2.1.2. Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data
Test Mode : Normal Operation

2.1.4. Output Power into Antenna & RF Exposure Evaluation Distance

Bluetooth

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 400 ~ 2 483.5	2	2	3.36	0.001 083	1

WLAN (2.4G)

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
2 400 ~ 2 483.5	4	2	1.22	0.001 049	1

WLAN (5G)

- Maximum tune up tolerance

Frequency (MHz)	Maximum Average Target Power (dB m)	Maximum Tune up (dB)	Antenna Gain (dB i)	Power Density at 20 cm (mW/cm ²)	Limits (mW/cm ²)
5 150 ~ 5 250	7	2	3.49	0.003 530	1
5 250 ~ 5 350	7	2	3.98	0.003 951	1
5 470 ~ 5 725	5	2	4.83	0.003 032	1
5 725 ~ 5 850	2	2	2.30	0.000 849	1

Note;

- The power density Pd (6th column) at a distance of 20 cm calculated from the friis transmission formula is far below the limit of 1 mW/cm².
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
- This equipment should be installed and operated with minimum 20 cm between the radiator and your body.
- The antenna gain of this transmitter is less than 6 dB i and must not be collocated or operating in conjunction with any other antenna or transmitter unless authorized to do so by the FCC.
- According to KDB 447498 D04 Interim General RF Exposure Guidance 2.1.



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Simultaneous transmission of RF Exposure test exclusion for worst case configuration.

Bluetooth: the ratio is 0.001 083 / 1

WLAN: the ratio is 0.003 951 / 1

Confirm the sum result of individual MPEs ratio is ≤ 1.0 ;

Bluetooth + WLAN: $(0.001\ 083 / 1) + (0.003\ 951 / 1) = 0.005\ 034 \leq 1.0$

- End of the Test Report -