

RF Exposure Evaluation Report

Product Name : Wireless Outdoor Router
Model No. : BEC 4700A,BiPAC 4700A
FCC ID : QI3BEC-4700A

Applicant : Billion Electric Co., Ltd.

Address : 8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei
City 231, Taiwan (R.O.C.)

Date of Receipt : Jul. 16, 2020
Date of Declaration : Nov. 06, 2020
Report No. : 2070587R-E3082100013
Report Version : V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Issued Date: Nov. 06, 2020

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Applicant	Billion Electric Co., Ltd.	
Address	8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei City 231, Taiwan (R.O.C.)	
Manufacturer	Billion Electric Co., Ltd.	
Model No.	BEC 4700A,BiPAC 4700A	
FCC ID.	QI3BEC-4700A	
Trade Name	BEC, Billion	
Applicable Standard	KDB 447498 D01 v06	<input checked="" type="checkbox"/> Minimum test separation distance ≥ 20 cm <input type="checkbox"/> For low power devices
Test Result	Complied	

Documented By :



(Senior Adm. Specialist / Joanne Lin)

Tested By :



(Senior Engineer / Wen Lee)

Approved By :



(Director / Vincent Lin)

Revision History

Report No.	Version	Description	Issued Date
2070587R-E3082100013	V1.0	Initial issue of report.	2020-11-06

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Wireless Outdoor Router
Trade Name	BEC, Billion
Model No.	BEC 4700A,BiPAC 4700A
FCC ID.	QI3BEC-4700A
Frequency Range	2412-2462MHz for 802.11b/g/n-20BW, 2422-2452MHz for 802.11n-40BW 802.11a/n/ac-20MHz: 5180-5240MHz, 5745-5825MHz 802.11n/ac-40MHz: 5190-5230MHz, 5755-5795MHz 802.11ac-80MHz: 5210MHz
Number of Channels	802.11b/g/n-20MHz: 11, n-40MHz: 7 802.11a/n/ac-20MHz: 9, 802.11n/ac-40MHz: 4, 802.11ac-80MHz: 1
Type of Modulation	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11a/n/ac: OFDM, BPSK, QPSK, 16QAM, 64QAM, 256QAM
Antenna Type	Omni Antenna
Channel Control	Auto
Antenna Gain	Refer to the table "Antenna List"

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Grand-Tek	OA-24-04-01-WI	Omni Antenna	4.0dBi for 2.4 GHz
2	Grand-Tek	OA-58-06-01-WI	Omni Antenna	6.0dBi for 5.150-5.250 GHz 6.0dBi for 5.725-5.850 GHz

Note: The antenna of EUT is conforming to FCC 15.203.

2. RF Exposure Evaluation

2.1. Standard Applicable

According to KDB 447498 D01 (7.1), A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits.

2.2. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

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 (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

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

π = 3.1416

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

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0

2.3. Test Result of RF Exposure Evaluation

Product : Wireless Outdoor Router
 Test Item : RF Exposure Evaluation

WLAN 2.4G Peak Gain: 4.0dBi

Band	Frequency (MHz)	Conducted maximum Peak Power (dBm)	Worst Case Duty Cycle (%)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Pass/Fail
2.4G	2412	29.86	81.27	1191.433	0.5954	1	Pass

Note: The Maximum conducted output power is refer to report No.: 2070587R-E3032110113 from the DEKRA.

WLAN 5G Peak Gain: 6.0dBi

Band	Frequency (MHz)	Conducted maximum Peak Power (dBm)	Worst Case Duty Cycle (%)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)	Pass/Fail
5G	5745	14.97	95.90	32.748	0.0259	1	Pass

Note: The Maximum conducted output power is refer to report No.: 2070587R-E3032110125 from the DEKRA.

2.4. Calculations for Multi-Transmitter

Worst Case Mode	Max Power (dBm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Safety distance	Ratios	Result	Limit
WLAN 2.4G	29.86	0.5954	1	20	0.5954	0.6213	1
WLAN 5G	14.97	0.0259	1		0.0259		

Ratios = Power Density / Limit