

# RF Exposure Evaluation

## of

E.U.T. : BL4000 2.4GHz WLAN ODU

FCC ID. : QZGBL4001-001

MODEL : BL4001

## for

APPLICANT : K-Best Technology Inc.

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Report Number : ET93R-03-099-01

**Product Information:**

Type of EUT: BL4000 2.4GHz WLAN ODU

FCC ID: QZGBL4001-001

Manufacturer: K-Best Technology Inc.

Model: BL4001

Description:

1. 2400~2483.5 MHz unlicensed ISM Band
2. IEEE 802.11 Standard
3. Provides DC Power to the ODU with PoE (Power over Ethernet).
4. 20 dB receive gain for the ODU
5. Bi-directional TDD technology
6. Transmitter and receiver LED
7. Waterproof housing
8. The Z-Com WLAN Access Point is currently certified with FCC ID: M4Y-325H2
9. 20dBm output power levels.
10. Antenna used:

Antenna Model	Antenna type	Antenna Gain (dBi)	Operation Restrictions
KBNT2402-17	omni	2	---
KBNT2406-17	omni	6	---
KBNT2411-17	omni	11	---
KBNT2416-14	sector	16	---
KBNT2418-16	panel	18	fixed, point-to-point operation
KBNT2420-13	grid	20	fixed, point-to-point operation
KBNT2424-13	grid	24	fixed, point-to-point operation

Note: According to 15.247(b)(4)(i), Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

Maximum conducted output power (measured): **19.29** dBm or **84.92** mW

The following table lists the provided authorized antennas:

Model	Antenna Type	Antenna Gain	
		(dBi)	Numeric
KBNT2402-17	omni	2	1.58
KBNT2406-17	omni	6	3.98
KBNT2411-17	omni	11	12.59
KBNT2416-14	sector	16	39.81
KBNT2418-16	panel	18	63.10
KBNT2420-13	grid	20	100.00
KBNT2424-13	grid	24	251.19

Below is an example of the RF Exposure Statement:

**Notice:**

**To comply with the FCC RF exposure compliance requirements, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 2 meters from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. No change to the antenna or the device is permitted. Any change to the antenna or the device could result in the device exceeding the RF exposure requirements and void user's authority to operate the device.**

## Relative Requirement for Compliance

According to section 1.1310 of FCC 47 CFR Part 1, limits for maximum permissible exposure (MPE) are as following:

**TABLE 1 – LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0 .....	614	1.63	*(100)	6
3-30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300 .....	61.4	0.163	1.0	6
300-1500 .....	.....	.....	f/300	6
1500-100,000 .....	.....	.....	5	6
(B) 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 <sup>2</sup> )	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

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational / controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

## RF Exposure Calculations:

The following information provides the minimum separation distance for the highest gain antenna provided. This calculation is based on the highest EIRP possible from the system, considering maximum power and antenna gain, and considering a 1.0 mW/cm<sup>2</sup> uncontrolled exposure limit. The formula shown in OET Bulletin 65 is used in the calculation.

Equation from page 19 of OET Bulletin 65, Edition 97-01 is:

$$S = PG / 4 R^2$$

where: S = power density (in appropriate units, e.g. mW/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mW)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

hence

$$R = (PG / 4 S)^{1/2}$$

For our device

$$P = 84.92 \text{ mW}$$

$$G = 251.19$$

$$S = \text{Exposure limit} = 1.0 \text{ mW/cm}^2$$

$$R = ((84.92 * 251.19) / (4 * 1.0))^{1/2}$$
$$= \mathbf{41.20 \text{ cm}}$$

For complying the FCC limits for general population/uncontrolled exposure, the minimum MPE distance is 41.20 cm.