



CTK Co., Ltd.  
The First Leader of Global Regulatory Compliance

# CTK Co., Ltd.

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## RF EXPOSURE EVALUATION

**Applicant** : KAONMEDIA Co., Ltd.

**Applicant Address** : KAONMEDIA Building, 884-3 Seongnam-daero,  
Bundang-gu, Seongnam-si, Gyeonggi-do, Korea

**Kind of Product** : SETTOP BOX

**Equipment model name** : VM3011C

**Antenna type** : Chip Antenna (BLE),  
PCB Antenna (WLAN\_ANT 0, 1, 2, 3)

### \*Antenna Gain

2.4GHz	ANT 1	1.9 dBi
	ANT 2	1.9 dBi
	ANT 3	1.9 dBi
	ANT 4	1.9 dBi
5GHz	ANT 1	2.0 dBi
	ANT 2	2.0 dBi
	ANT 3	2.0 dBi
	ANT 4	2.0 dBi
BLE	ANT	1.99 dBi



## Standard Requirement

The following RF exposure procedures are applicable :

*Part 1.1310 Radiofrequency radiation exposure limits*

*Part 2.1091 Radiofrequency radiation exposure evaluation : Mobile device*

Table 1 below sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

*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)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f <sup>2</sup>	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
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
300-1,500			f/1500	30
1,500-100,000			<b>1.0</b>	30

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



## **\*\* MPE Calculations \*\***

The EUT will only be used with a separation of 50 centimeters or greater between the antenna and the body of the user. The MPE calculation for this exposure is shown below.

The peak radiated output power (EIRP) is calculated as follows:

$EIRP = P + G$	Where, P = Power input to the antenna (mW) G = Power gain of the antenna (dBi)
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The numeric gain(G) of the antenna with a gain specified in dB is determined by:

$$G = \text{Log}^{-1} (\text{dB antenna gain} / 10)$$

### **Power density at the specific separation:**

$S = PG / (4R^2\pi)$	Where, S = Maximum power density (mW/cm <sup>2</sup> ) P = Power input to the antenna (mW) G = Numeric power gain of the antenna R = Distance to the center of the radiation of the antenna (50cm = limit for MPE)
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The Maximum permissible exposure (MPE) for the general population is 1 mW/cm<sup>2</sup> .  
The power density at 50cm does not exceed the 1 mW/cm<sup>2</sup> limit.

### **Estimated safe separation:**

$R = \sqrt{(PG / 4\pi)}$	Where, P = Power input to the antenna (mW) G = Numeric power gain of the antenna R = Distance to the center of the radiation of the antenna (50cm = limit for MPE)
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## WLAN 2.4 GHz

Mode	P (dBm)	P (mW)	G (dBi)	S (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
ANT1	16.66	46.34	1.9	<b>0.0143</b>	<b>1</b>
ANT2	15.98	39.63	1.9	<b>0.0122</b>	
ANT3	15.89	38.82	1.9	<b>0.0120</b>	
ANT4	16.32	42.85	1.9	<b>0.0132</b>	

## WLAN 5 GHz

Mode	P (dBm)	P (mW)	G (dBi)	S (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
ANT1	21.91	155.24	2.0	<b>0.0489</b>	<b>1</b>
ANT2	20.74	118.58	2.0	<b>0.0374</b>	
ANT3	20.42	110.15	2.0	<b>0.0347</b>	
ANT4	20.66	116.41	2.0	<b>0.0367</b>	

## BLE

Mode	P (dBm)	P (mW)	G (dBi)	S (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
BLE	6.68	4.66	1.99	<b>0.0015</b>	<b>1</b>

## Multiple chain transmitters (2.4 GHz + 5 GHz + BLE)

Mode	P (dBm)	P (mW)	G (dBi)	S (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
Combined	-	-	-	<b>0.2109</b>	<b>1</b>