

## Maximum Permissible Exposure (MPE)

### Product General Description (end product):

Product Name:	K3 Gateway
Brand:	N/A
Model:	T1
Model different:	N/A
Power Supply:	5Vdc from USB of Wall Sockets
Co-location:	Yes, BT and Wifi modular as below description
Simultaneous:	Yes, BT and Wifi

### Bluetooth(1Tx/1RX): FCC full modular approved modular

Frequency Range:	2402 – 2480MHz
FCC ID:	2AI6W-MCRYA01
Bluetooth Version:	V4.0
Tune-up power	-2dBm
Power Tolerance:	+/- 1.5dBm
Antenna Designation:	Chip Antenna, 3.1dBi max

The EUT is compliance with Bluetooth 4.0 Standard.

### Wifi(1Tx/1RX): FCC full modular approved modular

Frequency Range:	2412 – 2462MHz
FCC ID:	VPYLB1CDIMP003
Output power	0.0883 W (19.46dBm)
Antenna Designation:	FIFA Antenna, 2.24dBi max

The Test report is applied for BT 4.0 (BLE) and Wifi.

### Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

**FCC: According to §1.1310 and §2.1091 RF exposure is calculated.**

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 (minute)
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
1500-15000	/	/	1.0	30

F = frequency in MHz,

\* = Plane-wave equipment power density

**Bluetooth Tune-Up Power:**

Maximum Permissible Exposure (MPE) Evaluation: The worst case of Average power

**Power measurement:** refer to Part15.247 report for details.

Frequency Range:	2402 – 2480MHz
Bluetooth Version:	V4.0
Tune-Up Power:	-2dBm +/-1.5 dB
Antenna Gain:	3.1dBi

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

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

Where: S = Power density

P = Power input to antenna

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

	CH 1-79	
Tune-Up power at antenna input terminal:	-2.00	(dBm)
Tune-Up power at antenna input terminal:	0.63	(mW)
Tune-Up power Tolerance:	1.50	dB
Duty cycle:	100.00	(%)
Maximum Pav :	0.89	(mW)
Antenna gain (typical):	3.10	(dBi)
Maximum antenna gain:	2.04	(numeric)
Prediction distance:	20.00	(cm)
MPE limit for uncontrolled exposure at prediction	1.00	(mW/cm <sup>2</sup> )
Power density at predication frequency at 20 (cm) distance	0.0004	(mW/cm <sup>2</sup> )

**Measurement Result:**

The worst power density is 0.0004 mW/cm<sup>2</sup> which is less than 1 mW/cm<sup>2</sup>.

WLAN mode:

Radio	Antenna Type	Antenna Manufacturer	Antenna Part No.	Transmit Frequency (MHz)	Max Peak Conducted Output Power (mW)	Duty Cycle	Duty Cycle Corrected Output Power (mW)	Antenna Gain (dBi)	Minimum Antenna Cable Loss (dB)	Power Density @ 20 cm (mW/cm <sup>2</sup> )	General Population Exposure Limit from 1.1310 (mW/cm <sup>2</sup> )
802.11(b/g/n)	PCBA PIFA	Electric Imp, Inc.	1CD	2437	88.325	1	88.325	2.24	0	0.029	1.000

\* A second antenna configuration with lower gain is also available: Antenova A5839 SMD chip antenna with 2.1 dBi of peak gain.

**Simultaneous transmission mode**

WLAN + BT Mode:

	BT	
Power density at predication frequency at 20 (cm)	0.0004	(mW/cm <sup>2</sup> )

	WLAN	
Power density at predication frequency at 20 (cm)	0.029	(mW/cm <sup>2</sup> )
2.4GHz + 5GHz Power density at predication frequency at 20 (cm) distance	0.0294000	(mW/cm <sup>2</sup> )
MPE limit for uncontrolled exposure at prediction	1	(mW/cm <sup>2</sup> )

**Result:**

The predicted power density level at 20 cm is 0.0294 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup>.

# PHOTOGRAPHS OF EUT

***EUT 1***



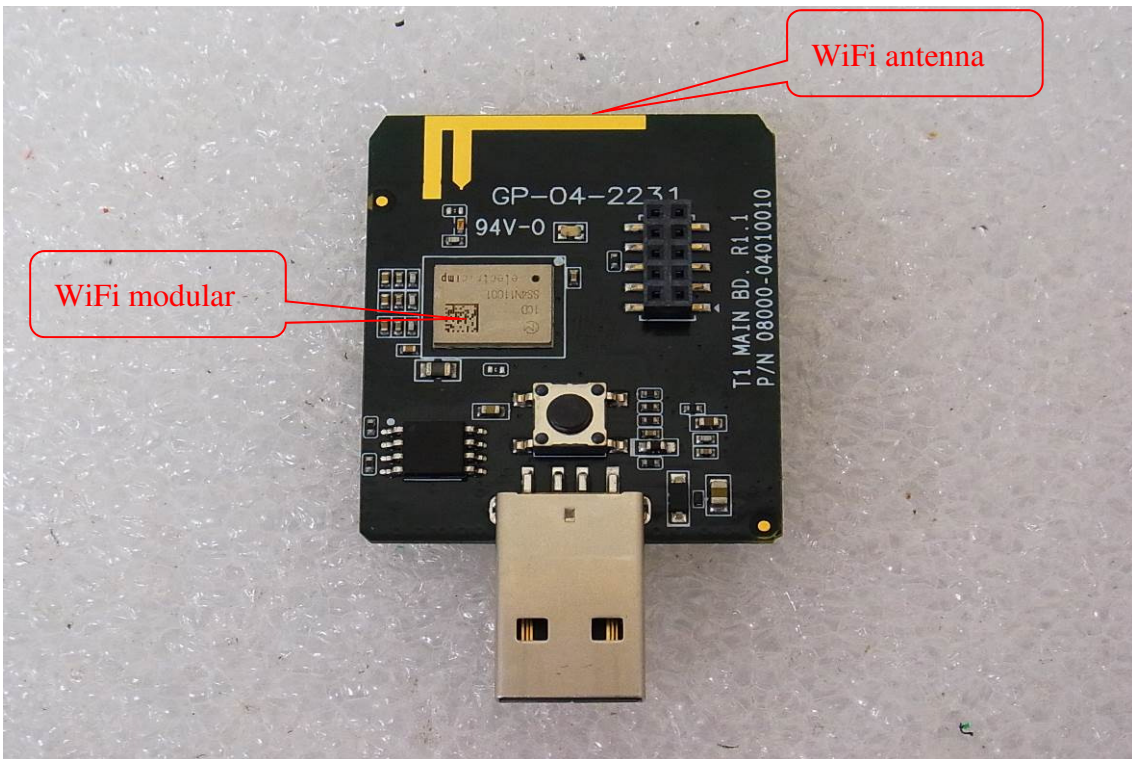
***EUT 2***



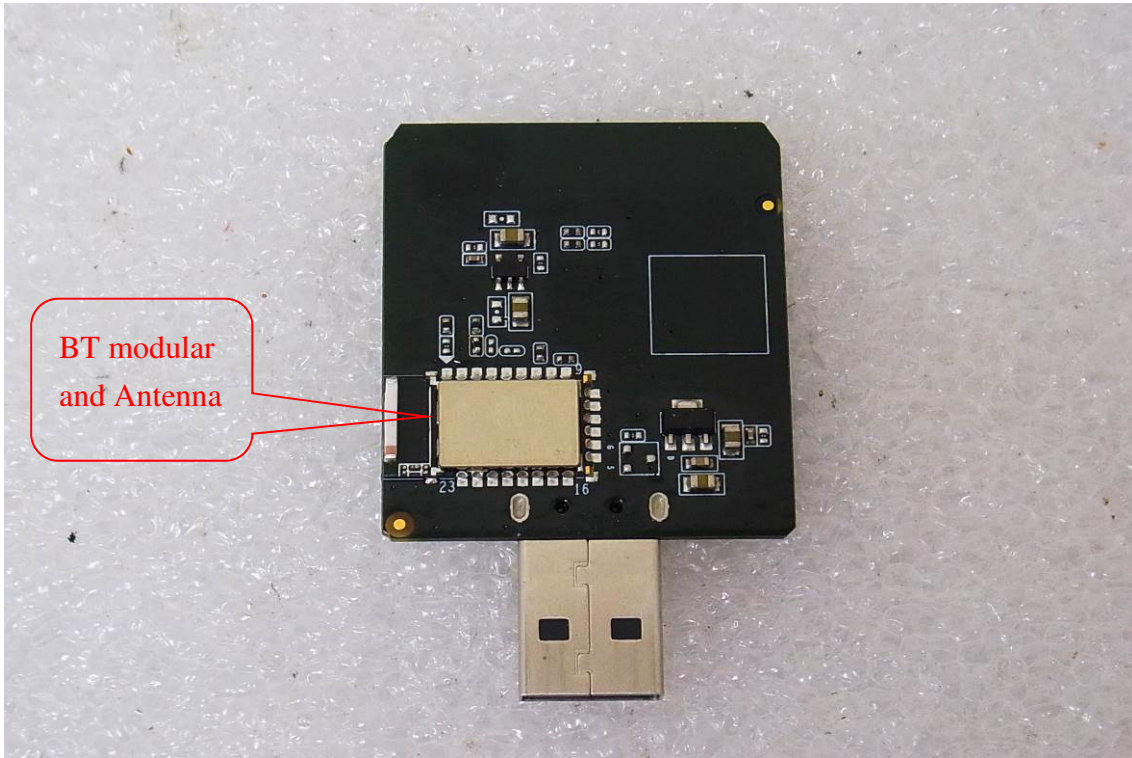
**EUT 3**



**EUT 4**



**EUT 5**



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