



## Maximum Permissible Exposure (MPE) & Exposure evaluation

**Report identification number: 1-1633/16-01-27**

Certification numbers and labeling requirements	
FCC ID	XKB-M7002WIBT
IC number	2586D-M7002WIBT
HVIN (Hardware Version Identification Number)	XTRA module MODU/7002 WiFi/BT
PMN (Product Marketing Name)	XTRA module
FVIN (Firmware Version Identification Number)	-/-
HMN (Host Marketing Name)	-/-

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

**Document authorized:**

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**EUT technologies:**

Technologies:	Max. power conducted: (AVG)	Max. antenna gain:	Min. pathloss:
Bluetooth 2.4 GHz	Declared 2.1 dBm	4.4 dBi	-- (if applicable)
WLAN 2.4 GHz	Declared 23 dBm	2.4 dBi	-- (if applicable)
WLAN 5 GHz	Declared 13 dBm	3.1 dBi	-- (if applicable)

**Prediction of MPE limit at given distance - FCC**

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 the antenna  
G = Antenna gain  
R = Distance to the center of radiation of the antenna

The table below is excerpted from Table 1B of 47 CFR 1.1310 titled "Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure"

Frequency Range (MHz)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
300 -1500	f/1500	30
1500 - 100000	1.0	30

where f = Frequency (MHz)

**Prediction: worst case**

	Technology	BT 2.4 GHz	WLAN 2.4 GHz	WLAN 5 GHz
P	Maximum output power	2.1 dBm	23 dBm	13 dBm
R	Distance	20 cm	20 cm	20 cm
G	Antenna gain	4.4 dBi	2.4 dBi	3.1 dBi
S	MPE limit for uncontrolled exposure	1.0 mW/cm <sup>2</sup>	1.0 mW/cm <sup>2</sup>	1.0 mW/cm <sup>2</sup>
	<b>Calculated Power density:</b>	<b>0.00088 mW/cm<sup>2</sup></b>	<b>0.069 mW/cm<sup>2</sup></b>	<b>mW/cm<sup>2</sup></b>
	<b>Percentage of limit: (BT + WLAN 2.4 GHz)</b>	<b>0.09%</b>	<b>6.9%</b>	<b>0.81%</b>
	<b>Collocation scenario 1: (BT + WLAN 2.4 GHz)</b>	<b>6.99%</b>		
	<b>Collocation scenario 2: (BT + WLAN 5 GHz)</b>	<b>0.90%</b>		

**This prediction demonstrates the following:**

The power density levels for FCC at a distance of 20 cm are below the maximum levels allowed by regulations.

**Prediction of MPE limit at given distance - IC**

RSS-102, Issue 5, 2.5.2

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $4.49/f^{0.5}W$  (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than  $1.31 \times 10^{-2} f^{0.6834} W$  (adjusted for tune-up tolerance), where  $f$  is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

Prediction: worst case

	Technology	BT 2450	WLAN 2450	WLAN 5 GHz
P	Maximum output power	2.1 dBm	23 dBm	13 dBm
G	Antenna gain	4.4 dBi	2.4 dBi	3.1 dBi
S	MPE limit for uncontrolled exposure	2675 mW )*	2675 mW )*	4478 mW )**
	<b>Calculated output power:</b>	<b>4.47 mW</b>	<b>347 mW</b>	<b>40.7 mW</b>
	<b>Collocation scenario 1: (BT + WLAN 2.4 GHz)</b>	<b>351 mW</b>		
	<b>Collocation scenario 2: (BT + WLAN 5 GHz)</b>	<b>45.2 mW</b>		

)\* lowest limit at 2400 MHz

)\*\* lowest limit at 5100 MHz

**Conclusion:** RF exposure evaluation is not required.

For applications where minimum distance to radiating element is 20cm Annex C of RSS-102 should be filled out.