

Maximum Permissible Exposure (MPE) & Exposure evaluation

Report identification number: 1-8503/19-01-01

Certification numbers and labeling requirements	
FCC ID	XKB-XTRAWIBTC
ISED number	2586D-XTRAWIBTC
HVIN (Hardware Version Identification Number)	MODU/7003 WiFi/BT MODU/7005 WiFi/BT MODU/8005 WiFi/BT
PMN (Product Marketing Name)	XTRA module
FVIN (Firmware Version Identification Number)	-/-
HMN (Host Marketing Name)	Lane/7000 Lane/8000

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.

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EUT technologies:

Technologies:	Max. power conducted: (AVG)	Max. antenna gain:
WLAN 5 GHz	Declared 10 dBm	Measured : 7.2 dBi
WLAN 2.4 GHz	Declared 20 dBm	Measured : 6.6 dBi
Bluetooth 2.4 GHz	Declared 3 dBm	Measured : 6.5 dBi

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 ²)	Averaging Time (minutes)
300 -1500	f/1500	30
1500 - 100000	1.0	30

where f = Frequency (MHz)

Prediction: worst case

	> 1500 MHz	> 1500 MHz	> 1500 MHz
Technology	BT @ 2450 MHz	WLAN @ 2450 MHz	WLAN @ 5 GHz
P Max power input to the antenna	3 dBm	20 dBm	10 dBm
R Distance	20 cm	20 cm	20 cm
G Antenna gain	6.5 dBi	6.6 dBi	7.2 dBi
S MPE limit for uncontrolled exposure	1 mW/cm ²	1 mW/cm ²	1 mW/cm ²
Calculated Power density:	0.0018 mW/cm ²	0.0910 mW/cm ²	0.0104 mW/cm ²
Collocation BT + WLAN 2.4 GHz	0.0928 mW/cm ²		
Collocation BT + WLAN 5.8 GHz	0.0122 mW/cm ²		

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 - ISED

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

		0.3 - 6 GHz	0.3 - 6 GHz	0.3 - 6 GHz
	Technology	BT 2.4 GHz	WLAN 2.4 GHz	WLAN 5 GHz
	Frequency	2450 MHz	2450 MHz	5180 MHz
P	Max power input to the antenna	3 dBm	20 dBm	10 dBm
R	Distance	20 cm	20 cm	20 cm
G	Antenna gain	6.5 dBi	6.6 dBi	7.2 dBi
	Maximum EIRP	8.9 mW	457.1 mW	52.5 mW
	Collocation BT + WLAN 2.4 GHz	466 mW		
	Collocation BT + WLAN 5 GHz	61.4 mW		
	Exclusion Limit from above:	2.71 W	2.71 W	4.53 W

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.