

5 FCC §15.407(f), § 1.1307(b)(3)(i) – RF Exposure

5.1 Applicable Standard

According to subpart 15.247(i) and subpart §1.1307(b)(3)(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

For single RF sources (*i.e.*, any single fixed RF source, mobile device, or portable device, as defined in paragraph (b)(2) of this section): A single RF source is exempt if:

(A) The available maximum time-averaged power is no more than 1 mW, regardless of separation distance. This exemption may not be used in conjunction with other exemption criteria other than those in paragraph (b)(3)(ii)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(ii)(A);

(B) Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

5.2 RF Exposure Evaluation Result

The EUT can be used in the following modes, selecting the worst mode for evaluation.

Mode 2: WIFI 2.4GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 2.4GHz Aux + BLE

Mode 3: WIFI 2.4GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 5GHz Aux + BLE

Mode 4: WIFI 5GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 2.4GHz Aux + BLE

Mode 5: WIFI 5GHz XOR + WIFI 5GHz Regular(4TX) + WIFI 5GHz Aux + BLE

Mode 6: WIFI 2.4GHz XOR + WIFI 5GHz Regular(8TX) + WIFI 2.4GHz Aux + BLE

Mode 7: WIFI 2.4GHz XOR + WIFI 5GHz Regular(8TX) + WIFI 5GHz Aux + BLE

Worst case is Mode 7 :

Project info

Band	Freq (MHz)	Tune-up Power (dBm)	Ant Gain (dBi)	Distances (mm)	Duty (%)	Tune-up Power (mW)	ERP (dBm)	ERP (mW)
BLE	2480	5	4	300	100%	3.16	6.85	4.84
WIFI 2.4G XOR	2462	24	10	300	100%	251.19	31.85	1531.09
WIFI 5G Regular(8TX)	5850	26	10.02	300	100%	398.11	33.87	2437.81
WIFI 5G AUX	5850	20.5	6	300	100%	112.20	24.35	272.27

Option A

The available maximum time-averaged power is no more than 1 mW

Band	Freq (MHz)	Result Option A
BLE	2480	not exempt
WIFI 2.4G XOR	2462	not exempt
WIFI 5G Regular(8TX)	5850	not exempt
WIFI 5G AUX	5850	not exempt

Option B

The available maximum time-averaged power or effective radiated power (ERP), whichever is greater.

This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).

Band	Freq (MHz)	Pth (mW)	X	ERP 20cm (mW)	Result Option B
BLE	2480	3060.00	1.905	3060	exempt
WIFI 2.4G XOR	2462	3060.00	1.903	3060	exempt
WIFI 5G Regular(8TX)	5850	3060.00	2.091	3060	exempt
WIFI 5G AUX	5850	3060.00	2.091	3060	exempt

Simultaneous Analysis :

Band	Freq (MHz)	PSD Require	PSD (mW/cm ²)	PSD Limit (mW/cm ²)	Simultaneous TX	Ratio
BLE	2480	exempt	0.001	1	O	0.001
WIFI 2.4G XOR	2462	exempt	0.222	1	O	0.222
WIFI 5G Regular(8TX)	5850	exempt	0.353	1	O	0.353
WIFI 5G AUX	5850	exempt	0.040	1	O	0.040
Simultaneous Analysis (Limit 1)						0.62

Result: The EUT meets exemption requirement- RF exposure evaluation greater than **30cm** distance.