FCC §1.1307 (b) (3) & §2.1091 –RF EXPOSURE

Applicable Standard

According to subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

According to KDB 447498 D04 Interim General RF Exposure Guidance

SAR-Based Exemption:

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum timeaveraged power or maximum time-averaged ERP, whichever is greater.

Per § 1.1307(b)(3)(i)(B), 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:

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:

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

Where

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

and

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

d = the separation distance (cm);

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^{a}\frac{P_i}{P_{th,i}} + \sum_{j=1}^{b}\frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c}\frac{Evaluated_k}{Exposure\ Limit_k} \le 1$$

MPE Results

Tune-Up Power Including Tolerance:

Mode	Frequency (MHz)	Tune up conducted power		Antenna Gain		ERP		Evaluation Distance (m)	Pth (mW)
		(dBm)	(mW)	(dBi)	(dBd)	(dBm)	(mW)		
UL	698-716	25.0	316.23	2.0	-0.15	24.85	305.49	0.2	1424
	776-787	24.0	251.19	2.0	-0.15	23.85	242.66	0.2	1583
	824-849	25.0	316.23	2.0	-0.15	24.85	305.49	0.2	1681
	1710-1755	21.0	125.89	3.0	0.85	21.85	153.11	0.2	3060
	1850-1915	22.0	158.49	3.0	0.85	22.85	192.75	0.2	3060
DL	728-746	2.0	1.58	2.0	-0.15	1.85	1.53	0.2	1485
	746-757	1.0	1.26	2.0	-0.15	0.85	1.22	0.2	1522
	869-894	2.0	1.58	2.0	-0.15	1.85	1.53	0.2	1773
	2110-2155	2.0	1.58	3.0	0.85	2.85	1.93	0.2	3060
	1930-1995	2.0	1.58	3.0	0.85	2.85	1.93	0.2	3060
BT	2402-2480	10.5	11.22	3.0	0.85	11.35	13.65	0.2	3060
BLE	2402-2480	2.0	1.58	3.0	0.85	2.85	1.93	0.2	3060
Wi-Fi	2412-2462	14.5	28.18	3.0	0.85	15.35	34.28	0.2	3060

Note:

The BT/BLE/Wi-Fi cannot transmit at same time
The BT or BLE or Wi-Fi can transmit at same time with booster

Simultaneously transmit consideration, the worst case:

The ratio= $P_{Booster}/Pth_{Booster}+ P_{Wi-Fi} / Pth_{Wi-Fi}$ =316.23/1424+34.28/3060=0.233<1.0

The ERP was calculated base on the maximum value of antenna gain and cable loss combination.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Pass