

FCC §1.1307 (b) (1) & §2.1091 –MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1307 (b)(1), 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.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (Minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

MPE Calculated :

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

MPE Results

Tune-Up Power Including Tolerance:

Mode	Frequency band (MHz)	Antenna Gain		Max Tune-up Power (dBm)	Cable loss (dB)	Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)
		(dBi)	(numeric)					
uplink	698-716	8	6.31	21.0	4.97	20	0.050	0.465
	776-787	8	6.31	19.0	4.97	20	0.032	0.517
	824-849	8	6.31	20.0	5.17	20	0.038	0.549
	1710-1755	9	7.94	20.0	7.51	20	0.028	1.0
	1850-1915	9	7.94	18.0	7.51	20	0.018	1.0
downlink	728-746	5	3.16	14.0	4.97	20	0.005	0.485
	746-757	5	3.16	14.0	4.97	20	0.005	0.497
	869-894	5	3.16	14.0	5.17	20	0.005	0.579
	2110-2155	7	5.01	14.0	7.51	20	0.004	1.0
	1930-1995	7	5.01	14.0	7.51	20	0.004	1.0

Note:

This EUT contains FCC ID: 2AC7Z-ESP32WROVERB, and the power density is

WIFI=0.1182mW/cm²,

BLE=0.0007 mW/cm²,

Bluetooth =0.0017 mW/cm²,

According to the MPE of FCC ID: 2AC7Z-ESP32WROVERB, WIFI and Bluetooth can't transmitting simultaneously, so consider the booster and WIFI transmitting simultaneously is the worst case:

The ratio= $MPE/Limit_{Booster} + MPE/Limit_{WIFI} = 0.05/0.465 + 0.1182/1 = 0.2257 < 1.0$

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

Result: Compliance