

FCC §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 1.1310, 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				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	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

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = 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);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data (worst case):

Mode	Frequency Range (MHz)	Maximum Antenna Gain*		Tune-up conducted Power*		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
802.11b	2412~2462	3.40	2.19	27.00	501.19	20	0.2183	1.0	0.2183
802.11g		3.40	2.19	26.00	398.11	20	0.1734	1.0	0.1734
802.11n-HT20		3.40	2.19	26.00	398.11	20	0.1734	1.0	0.1734
802.11n-HT40	2422~2452	3.40	2.19	27.00	501.19	20	0.2183	1.0	0.2183
BLE	2402~2480	3.40	2.19	7.00	5.01	20	0.0022	1.0	0.0022
BT	2402~2480	3.40	2.19	9.00	7.94	20	0.0035	1.0	0.0035

Mode	Frequency Range (MHz)	Maximum Antenna Gain*		Tune-up EIRP*		Evaluation Distance (cm)	Power Density (mW/cm ²)	MPE Limit (mW/cm ²)	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)				
SRD	285.5-505.5	/	/	-2.5	0.56	20	0.0001	0.2	0.0005

Note:

- (1) The EUT Contains FCC ID: 2AC7Z-ESP32WROVERE (Grant on:04/13/2020)
 (2) The SRD EIRP = 92.62 dBμV/m -95.2 = -2.58dBm.
 (3) The worst condition of transmit simultaneously (WiFi&SRD) is as below:

$$\sum_i \frac{S_i}{S_{Limit,i}} = 0.2183 + 0.0005 = 0.2188 < 1.0$$

Conclusion: The device meets MPE at distance 20cm.