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/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

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:

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

Mode	Frequency Range (MHz)	Maximum Antenna Gain*		Tune-up conducted Power*		Evaluation Distance	Power Density	MPE Limit	MPE ratio
		(dBi)	(numeric)	(dBm)	(mW)	(cm)	(mw/cm ²)	(mw/cm ²)	
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
802.11 n-HT20		3.40	2.19	26.00	398.11	20	0.1734	1.0	0.1734
802.11 n-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

Calculated Data (worst case):

Mode	Frequency Range (MHz)	Maximum Antenna Gain*		Tune-up EIRP★		Evaluation Distance	Power Density	MPE Limit	MPE
		(dBi)	(numeric)	(dBm)	(mW)	(cm)	(mW/cm ²)	(mW/cm ²)	ratio
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 dB μ V/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.