

RF Exposure Evaluation

Reference: CFR 47 FCC Part 1.1310

Description: Both transmitters in the device have the possibility of transmitting simultaneously. The worst-case exposure for each transmitter was used to calculate the percentage of the allowable limit that each transmitter contributed. All of the percentages were then added together to verify that at the specified operating distance, they were below the allowable limit.

All measurements were peak or RMS power readings taken from test reports from accredited test labs. Antenna gains were taken from the manufacturer's specifications.

Limits: Maximum exposure limits from CFR 47, FCC Part 1.1310:

Table 1 - Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
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
300-1,500			f/1500	30
1,500-100,000			1.0	30

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FCC RF Exposure Calculations:

Transmitter	Frequency	Antenna Gain	Power	Power +10% for tolerance	Power Density	Limit at specified distance	% of limit	Highest	Total of highest	FCC ID
	MHz	numerical	mW	mW	mW/cm ²	mW/cm ²				
1	904.3	3.8	475	522.5	0.3950	0.6029	65.52%	1	65.52%	2AOSN-GWLRN1ODC1
(2) 699-849 MHz	699	1.58	226	248.6	0.0781	0.4660	16.77%	1	16.77%	2ANPO00NRF9160
(2) 1710-1915 MHz	1710	1.58	245	269.5	0.0847	1.0000	8.47%			2ANPO00NRF9160
								TOTAL	82.29%	Result: exempt

Table 2 - Calculations according to CFR 47, Part 1.1310, Table 1(B)

Specified distance = 20 cm

For each radio, the frequency with the lowest limit was used and the highest power of each frequency band to calculate the worse-case RF exposure.

When measurements were performed as EIRP, the antenna gain is listed as 1. In cases where the antenna gain is not listed as 1, the power measurement was performed as conducted and the antenna gain from the manufacturer's datasheet was used.

Transmitter 1 peak antenna gain = 5.8 dBi = 3.8 numeric gain

Transmitter 1 peak antenna gain = 2 dBi = 1.58 numeric gain

Gain values taken from antenna datasheets

The power density is calculated as shown below:

$$S = (P \times G) / (4 \times \pi \times d^2)$$

$d = 20 \text{ cm}$ - used to calculate exposure at 20 cm

$$1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$