

## RF Exposure Limits for Attic Antennas – Rev A

For those in antenna-restricted areas, an attic antenna can do wonders – especially on the higher HF bands (15m, 12m and 10m) during the day of a fall and winter month when we’re around solar maximum. If you have a bigger than average attic, you could even accommodate a low band antenna (maybe not 160m, though!).

The FCC requires an Amateur Radio operator to do an RF exposure limit assessment for his/her antennas. Although the FCC does not require hams to keep a copy of their RF safety evaluations, it’s probably a good idea to have the evaluations on file. Let’s go through some scenarios to get an idea of what may be a problem with attic antennas.

We’ll run the calculation (using the calculator at [www.arrl.org/rf-exposure-calculator](http://www.arrl.org/rf-exposure-calculator)) for four modes at four frequencies at 100 Watts to a dipole antenna for a controlled environment (where people are aware that RF could be a hazard) and for an uncontrolled environment (where people aren’t aware that RF could be a hazard). Don’t forget to reduce the transmitter power by the loss in the coax to get to the antenna – for these runs I assumed no loss. These results also include the effect of ground reflections (worst case). Here are those results.

mode (100W at the dipole)	mode duty cycle	transmit ON/OFF ratio	overall duty cycle	1.8 MHz		14.2 MHz		28.4 MHz		50.1 MHz	
				controlled environment	uncontrolled environment	controlled environment	uncontrolled environment	controlled environment	uncontrolled environment	controlled environment	uncontrolled environment
put a brick on the key in CW - WORST CASE	100%	100%	100%	0.54 feet	0.73 feet	2.58 feet	5.76 feet	5.15 feet	11.52 feet	5.44 feet	12.17 feet
FT8/FM/FSK/RTTY	100%	50%	approx 50%	0.42 feet	0.57 feet	2.00 feet	4.46 feet	3.99 feet	8.93 feet	4.22 feet	9.43 feet
conversational CW	40%	50%	20%	0.27 feet	0.36 feet	1.26 feet	2.82 feet	2.52 feet	5.65 feet	2.67 feet	5.96 feet
conversational SSB (no processor)	20%	50%	10%	0.19 feet	0.25 feet	0.89 feet	2.00 feet	1.79 feet	3.99 feet	1.89 feet	4.22 feet

If you’re on 20m SSB in a conversational QSO, the safe distance for someone who is not familiar with RF is 2 feet. If you’re on FT8 on 20m, the safe distance is almost 5 feet. If you’re on FT8 on 6m, the safe distance is almost 10 feet. Those values could be a problem if your shack is also in the attic (and maybe even under a controlled environment). If someone is up on the roof working, maybe you shouldn’t transmit.

The trends in the RF exposure limits are obvious. You need to be farther away as the frequency is increased. And you need to be farther away with higher duty cycles (both the waveform duty cycle and the transmission duty cycle).

Higher power could be a problem, too. If you are running a kilowatt with your attic antenna dipole or you have a small HF Yagi with a kilowatt (that takes a big attic, but it’s been done!), you should run the calculations at those power levels and antenna gains. You may have to mitigate the results by reducing power or using modes with lower duty cycles or moving your shack farther away from where the antenna is in the attic.

The RF exposure limits need to be done for outdoor antennas, too. Mitigation for these scenarios could be a fence around the antenna or moving an antenna higher up on your tower.