

Field Day Antenna Comparison

I have modeled a number of antennas over the years and thought it would be informative to summarize the results for 20 meters (a Field Day “money” band). See the chart below.

Where possible, the antenna height is 35 feet (about ½ wavelength on 20 meters). 35 feet is do-able on field day (or at home) and results in an elevation take off angle suitable for domestic contesting from north central USA.

Conclusions:

- The difference between a vertical and a horizontal antenna at ½ wavelength is significant (over 1 s-unit). A vertical on 20 meters should be considered an antenna of last resort unless you are on a DX-expedition next to sea water.
- A full size three element mono band yagi yields almost one s-unit gain over a dipole. A beam is your first choice.
- If you can’t manage a beam, a dipole is not a bad antenna. It has the advantage of being bi-directional (work both coasts at the same time). A significant disadvantage of a wire dipole is that it is not rotatable. Consider installing two switchable dipoles at right angles to one another for better coverage.
- Single loop antennas do not have more gain than a dipole.

Antenna Type (20 meters mono-band)	Height (Feet)	Gain (dbi)	Gain (dbd)	elevation angle peak (degrees)	Notes
Vertical (quarter wave)	8	0.5	-6.9	19	Two sloping ¼ wave radials
Inverted V Dipole (half wave)	35	7.0	-0.4	29	Center height 35 feet. Ends at 29 feet.
Horizontal Dipole (half wave)	35	7.4	0	28	
Diamond loop (one wavelength – cubical quad driven element)	35	7.5	0.1	26	
Tuned loop (triangle about one wavelength long)	40	7.5	0.1	27	Height is height of horizontal top wire. Tuned using 450 ohm ladder line stub.
2 element yagi (half size)	35	7.7	0.3	26	Loading coils at center of each element
Hex Beam (2 element)	35	9.6	2.2	25	
Stacked Dipoles (half wave)	35/70	10.2	2.8	17	
Spider Beam (3 element)	35	10.6	3.2	26	
2 element yagi (full size)	35	10.9	3.5	26	
2 element diamond cubical quad	35	11.3	3.9	25	
3 element yagi (full size)	35	12.1	4.7	25	

- All antennas are single band for 20 meters. They do not include loading coils except where noted.
- All antennas modeled over average ground. Model includes gain due to ground reflection.
- All antennas modeled using NEC2GO
- Gain (dbi) = gain over an isotropic radiator. Gain (dbd) = gain over a dipole.
- Models do not account for nearby obstructions (buildings, vehicles, etc). Antennas work best when located away from obstructions.