Practical Antennas

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Dimensions for Vertical Full Wave Loops

Here we looked at the **Yagi-Uda** and **Quad** Yagi designs, in the case that could be changed to give different dimensions, and that different shapes (and sizes) could be used to achieve the same results. The Yagi-Uda design, for example, has the two options of **Dimensions** and **Wire Loop Antennas**.

The traditional formula for the length of a full wave loop antenna (in feet) is: 1005 / f, where f is the frequency in MHz. This is a useful reference point, but there are other options that numbers.

Dimensions for loops can include any adjustment for the shape, wire size or insulation, though above ground etc. Since the traditional formula for the length of a loop was not reliable, other than as a rough estimate, in this article I've provided tables of dimensions for loops, where the length is not the formula. This is particularly important for loops with wire size close to the ground, where the effect of the ground will vary depending on the wire size.

Please note the limitations in the formulas: they are calculated for specific sizes of wire and heights over typical ground. They may vary somewhat for different wire sizes and heights, and over different types of ground. The tables are based on the formulas, though you can use them to see what effect changing the wire length would give for that tuning. As usual, shortening the wire raises the resonant frequency, and tuning to higher frequencies will need a shorter length than the tables. Adjusting the wire diameter, on the other hand, increases capacitance, while making it narrower and later will increase inductance. Wire size, and insulation, will also affect capacitance, and so will the total wire length (or the overall length of the resonant frequency where you want it. Feed stone wire wires between the horizontal and vertical dimensions is the low the SWR, and the higher the resonant frequency. Wire size, and insulation, will also affect capacitance, and so will the total wire length (or the overall length of the resonant frequency where you want it. Feed stone wire wires between the horizontal and vertical dimensions is the low the SWR, and the higher the resonant frequency. Wire size, and insulation, will also affect capacitance, and so will the total wire length (or the overall length of the resonant frequency where you want it.

Generally the horizontal polarised loop will have more on the details of the available supports than any antenna performance difference among them.

For polarised dimensions for horizontal polarised loops, 7 MHz, 14 MHz, and 28 MHz, the first loop can be fed directly with coax (loop ripple each with ratio 1:1 ratio load), the second loop can be fed with a quarter wavelength of 50 ohm feedline (loop ripple each with a 2:1 ratio load), and the third loop can also use a 1 : 1 balun and a quarter wavelength of 50 ohm feedline (loop ripple each with a per 50 ohm cable).

- Dimensions for horizontally polarised diamond loops
- Dimensions for horizontally polarised diamond loops
- Dimensions for vertically polarised rectangular loops
- Dimensions for vertically polarised rectangular loops
- Dimensions for vertically polarised delta loops (with gap)

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Data for horizontally polarized rectangular loops

By averaging the ends of the length of the vertical sides to the horizontal ones, we can vary the impedance of a horizontally polarized rectangular loop over a wide range. A rectangular loop with the ends of the vertical sides shorter than the horizontal ones will high enough in the air to radiate effectively. It will have a vertically biased pattern and be better to close the ground. A further discussion of the effect of height above ground is in the **Theory of Loops**.

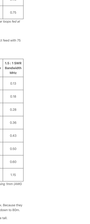
50 ohm rectangular loops

Typical 50 ohm rectangular loop dimensions are for 1.5m (2400) IFA bars with, since the top of the loop at about 5W equivalent above the ground. That puts the bottom of the loop at 2.5m, which is a safe height for a loop. Since the ends are higher than the loop, using thicker wire may be a good idea (changing to 2 mm (2400) IFA) and adds the resonant frequency up by about 0.5%. **(Online e-dipole, Solar wire requires more length in a loop.)**

Because they are high enough off the ground, these antennas scale fairly well from 7 MHz to 28 MHz, and can be used on 3.5 MHz if the ends are bent down to the centre of the loop. However, the wire does vary widely to vertically polarized rectangular loops at low heights due to ground interaction. I have provided separate tables for those.

If larger diameter tubing is not used for the horizontal portions of the loop, then it will be better to use the vertical sections.

Note SWR bandwidths are approximate, but will give a good idea of how much narrower the bandwidth is the 50 ohm loops compared to those with higher impedances. This also gives an idea of the required construction tolerance.



50 ohm vertical rectangular horizontally polarized

Frequency MHz	Wire Length	Width	Height	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
7	44 m (144 ft)	7.5 m (24 ft)	10.7 m (35 ft)	0.25	0.08
10.1	31 m (102 ft)	5.3 m (17.5 ft)	10.2 m (33.5 ft)	0.12	0.12
14	22.3 m (73 ft)	3.8 m (12.5 ft)	7.4 m (24.3 ft)	0.12	0.18
18.1	17.3 m (57 ft)	2.9 m (9.5 ft)	5.9 m (19.4 ft)	0.42	0.24
21.2	16.8 m (55.1 ft)	2.8 m (9.2 ft)	4.8 m (15.8 ft)	0.50	0.28
24.9	12.8 m (42 ft)	2.1 m (7 ft)	4.2 m (13.8 ft)	0.60	0.34
28.4	11 m (36.1 ft)	1.85 m (6.1 ft)	3.7 m (12.1 ft)	0.70	0.40
50.5	6.35 m (20.8 ft)	1.05 m (3.5 ft)	2.08 m (6.8 ft)	1.35	0.75

Vertical dimensions for 50 ohm horizontally polarized rectangular loops. Note that the bandwidth figures are for the 50 ohm loops compared to those with higher impedances. This also gives an idea of the required construction tolerance.

75 ohm rectangular loops

These loops are similar to the 50 ohm loop, but dimensioned for direct feed with 75 ohm coax. SWR bandwidth is a bit wider than for the 50 ohm loop.

Frequency MHz	Wire Length	Width	Height	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
7	44 m (144 ft)	7.5 m (24 ft)	10.7 m (35 ft)	0.25	0.08
10.1	31 m (102 ft)	5.3m (17.5 ft)	10.2m (33.5 ft)	0.33	0.18
14	22.3 m (73 ft)	3.8m (12.5 ft)	7.4m (24.3 ft)	0.48	0.28
18.1	17.3 m (57 ft)	2.9 m (9.5 ft)	5.9 m (19.4 ft)	0.62	0.36
21.2	16.8 m (55.1 ft)	2.8 m (9.2 ft)	4.8 m (15.8 ft)	0.76	0.43
24.9	12.8 m (42 ft)	2.1 m (7 ft)	4.2 m (13.8 ft)	0.90	0.50
28.4	11 m (36.1 ft)	1.85 m (6.1 ft)	3.7 m (12.1 ft)	1.05	0.60
50.5	6.35 m (20.8 ft)	1.05 m (3.5 ft)	2.08 m (6.8 ft)	1.75	1.00

Vertical dimensions for 75 ohm horizontally polarized rectangular loops. Note that the bandwidth figures are for the 75 ohm loops compared to those with higher impedances.

112 ohm rectangular loops

112 ohm loops match to 50 ohms using 1/4 wavelength of 75 ohm coax. Because they are shorter than the lower impedance loops, I've included a bandwidth table in 50 ohms.

These loops are close to square, being only slightly wider than they are tall.

Frequency MHz	Wire Length	Width	Height	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
7	44 m (144 ft)	7.5 m (24 ft)	10.7 m (35 ft)	0.25	0.08
10.1	31 m (102 ft)	5.3m (17.5 ft)	10.2m (33.5 ft)	0.33	0.18
14	22.3 m (73 ft)	3.8m (12.5 ft)	7.4m (24.3 ft)	0.48	0.28
18.1	17.3 m (57 ft)	2.9 m (9.5 ft)	5.9 m (19.4 ft)	0.62	0.36
21.2	16.8 m (55.1 ft)	2.8 m (9.2 ft)	4.8 m (15.8 ft)	0.76	0.43
24.9	12.8 m (42 ft)	2.1 m (7 ft)	4.2 m (13.8 ft)	0.90	0.50
28.4	11 m (36.1 ft)	1.85 m (6.1 ft)	3.7 m (12.1 ft)	1.05	0.60
50.5	6.35 m (20.8 ft)	1.05 m (3.5 ft)	2.08 m (6.8 ft)	1.75	1.00

Vertical dimensions for 112 ohm vertically polarized rectangular loops. Note that the bandwidth figures are for the 112 ohm loops compared to those with higher impedances.

200 ohm rectangular loops

These dimensions for 200 ohm rectangular loops match to the 4 ohm balun and for a leg length of 1/2 wavelength, or the feeder loop are more other used with a low leg length. They have proportional square to wide shape to avoid the high impedance.

They can be matched with a 4 : 1 balun, or using 1/4 wavelength of 100 ohm feedline. The American Yagi-Uda's typically 100 to 150 ohms, and so this can be a reasonable 3 mW sender and shorter, to give a feedpoint around 2 to 3 ohm.

Frequency MHz	Wire Length	Width	Height	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
3.5	90 m (300 ft)	30 m (98.4 ft)	34 m (111 ft)	0.05	0.06
3.8	85 m (284 ft)	28 m (91 ft)	32 m (105 ft)	0.05	0.06
5.05	68.4 m (224 ft)	22.5 m (74 ft)	25.7 m (84.3 ft)	0.04	0.25
7	49.4 m (162 ft)	16.3 m (53.5 ft)	18.5 m (60.7 ft)	0.60	0.36
10.1	37 m (121.4 ft)	12.2 m (40 ft)	13.9 m (45.6 ft)	0.90	0.50
14.1	26.4 m (86.6 ft)	8.7 m (28.5 ft)	9.9 m (32.5 ft)	1.35	0.75
18.1	20.6 m (67.6 ft)	6.8 m (22.3 ft)	7.7 m (25.3 ft)	1.65	0.87
21.2	17.6 m (57.8 ft)	5.8 m (19 ft)	6.6 m (21.6 ft)	1.90	1.05
24.9	15 m (49.2 ft)	4.95 m (16.2 ft)	5.6 m (18.4 ft)	2.20	1.20
28.4	13 m (42.6 ft)	4.3 m (14.1 ft)	4.9 m (16.1 ft)	2.50	1.40
50.5	6.35 m (20.8 ft)	1.85 m (6.1 ft)	2.08 m (6.8 ft)	1.40	1.50

Vertical dimensions for 200 ohm vertically polarized rectangular loops, with the ends of the vertical sides shorter than the horizontal ones, and the ends of the vertical sides longer than the horizontal ones.

Data for horizontally polarized diamond loops

Diamond loops are the latter of the shapes, and don't make so good of a use of the available height as the other shapes. However, they can hang from a single high point, and have the ends of the sides low to the ground, so they are quite useful for those hanging out. With a single top support, they can also be stretched between trees.

These dimensions are for loops made using 1mm (2400) IFA bars wire, with the centre of the loop at 5W equivalent above the ground. Wire sizes are relatively independent of height. They may require some adjustment if the bottom is close to the ground.

50 ohm diamond loops

Typical 50 ohm diamond loop dimensions are for a 1mm (2400) IFA bars, or other single high support, with the sides 5m of with spaces. Tying a short piece of string horizontally between the two side corners makes it easier to maintain the desired wire spacing. Because the ends are higher than the loop, using thicker wire may be a good idea (2mm (2400) IFA bars wire used). Wire sizes are not so critical for this loop, but it will be useful any feedline, which may make them attractive for backpacking or other portable operation where weight is important, although some adjustment to the loop length may be needed.

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
3.5	44.0 m (144 ft)	10 m (32.8 ft)	20 m (65.6 ft)	11.0 m (36.1 ft)	0.045	0.085
3.8	39.4 m (129.3 ft)	7 m (23 ft)	18.4 m (60.4 ft)	10.2 m (33.5 ft)	0.05	0.09
5.1	29.4 m (96.5 ft)	5.3 m (17.4 ft)	13.8 m (45.3 ft)	7.6 m (24.9 ft)	0.07	0.12
7	22.0 m (72.2 ft)	4.0 m (13.1 ft)	10.4 m (34.1 ft)	5.8 m (19 ft)	0.09	0.16
10.1	15.2 m (49.9 ft)	2.8 m (9.2 ft)	7.2 m (23.6 ft)	4.0 m (13.1 ft)	0.12	0.22
14.1	10.9 m (35.8 ft)	2.0 m (6.6 ft)	5.2 m (17 ft)	2.9 m (9.5 ft)	0.17	0.31
18.1	8.5 m (27.9 ft)	1.6 m (5.2 ft)	4.0 m (13.1 ft)	2.2 m (7.2 ft)	0.21	0.39
21.2	7.3 m (24 ft)	1.3 m (4.3 ft)	3.4 m (11.2 ft)	1.9 m (6.2 ft)	0.25	0.46
24.9	6.2 m (20.3 ft)	1.2 m (3.9 ft)	2.9 m (9.5 ft)	1.6 m (5.2 ft)	0.30	0.55
28.4	5.4 m (17.7 ft)	1.0 m (3.3 ft)	2.5 m (8.2 ft)	1.4 m (4.6 ft)	0.35	0.64
50.5	3.2 m (10.5 ft)	0.6 m (1.9 ft)	1.5 m (4.9 ft)	0.8 m (2.6 ft)	0.60	1.10

Horizontal dimensions for 50 ohm diamond loops. Note that the bandwidth figures are for the 50 ohm loops compared to those with higher impedances.

112 ohm diamond loops

These 200 ohm loops match to a 4 : 1 balun, or can be dimensioned to be matched with 1/4 wavelength of 75 ohm coax cable. SWR bandwidth is about 50% wider.

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
3.5	44.0 m (144 ft)	10 m (32.8 ft)	20 m (65.6 ft)	11.0 m (36.1 ft)	0.06	0.09
3.8	39.4 m (129.3 ft)	7 m (23 ft)	18.4 m (60.4 ft)	10.2 m (33.5 ft)	0.07	0.10
5.1	29.4 m (96.5 ft)	5.3 m (17.4 ft)	13.8 m (45.3 ft)	7.6 m (24.9 ft)	0.09	0.14
7	22.0 m (72.2 ft)	4.0 m (13.1 ft)	10.4 m (34.1 ft)	5.8 m (19 ft)	0.12	0.19
10.1	15.2 m (49.9 ft)	2.8 m (9.2 ft)	7.2 m (23.6 ft)	4.0 m (13.1 ft)	0.17	0.27
14.1	10.9 m (35.8 ft)	2.0 m (6.6 ft)	5.2 m (17 ft)	2.9 m (9.5 ft)	0.24	0.37
18.1	8.5 m (27.9 ft)	1.6 m (5.2 ft)	4.0 m (13.1 ft)	2.2 m (7.2 ft)	0.29	0.47
21.2	7.3 m (24 ft)	1.3 m (4.3 ft)	3.4 m (11.2 ft)	1.9 m (6.2 ft)	0.35	0.55
24.9	6.2 m (20.3 ft)	1.2 m (3.9 ft)	2.9 m (9.5 ft)	1.6 m (5.2 ft)	0.42	0.66
28.4	5.4 m (17.7 ft)	1.0 m (3.3 ft)	2.5 m (8.2 ft)	1.4 m (4.6 ft)	0.49	0.77
50.5	3.2 m (10.5 ft)	0.6 m (1.9 ft)	1.5 m (4.9 ft)	0.8 m (2.6 ft)	0.85	1.35

Horizontal dimensions for 200 ohm diamond loops. Note that the bandwidth figures are for the 200 ohm loops compared to those with higher impedances.

50 ohm delta loops

The 50 ohm loops are a bit shorter and wider than the 50 ohm loops, but the wire sizes matches are the same.

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
3.5	44.0 m (144 ft)	10 m (32.8 ft)	20 m (65.6 ft)	11.0 m (36.1 ft)	0.045	0.085
3.8	39.4 m (129.3 ft)	7 m (23 ft)	18.4 m (60.4 ft)	10.2 m (33.5 ft)	0.05	0.09
5.1	29.4 m (96.5 ft)	5.3 m (17.4 ft)	13.8 m (45.3 ft)	7.6 m (24.9 ft)	0.07	0.12
7	22.0 m (72.2 ft)	4.0 m (13.1 ft)	10.4 m (34.1 ft)	5.8 m (19 ft)	0.09	0.16
10.1	15.2 m (49.9 ft)	2.8 m (9.2 ft)	7.2 m (23.6 ft)	4.0 m (13.1 ft)	0.12	0.22
14.1	10.9 m (35.8 ft)	2.0 m (6.6 ft)	5.2 m (17 ft)	2.9 m (9.5 ft)	0.17	0.31
18.1	8.5 m (27.9 ft)	1.6 m (5.2 ft)	4.0 m (13.1 ft)	2.2 m (7.2 ft)	0.21	0.39
21.2	7.3 m (24 ft)	1.3 m (4.3 ft)	3.4 m (11.2 ft)	1.9 m (6.2 ft)	0.25	0.46
24.9	6.2 m (20.3 ft)	1.2 m (3.9 ft)	2.9 m (9.5 ft)	1.6 m (5.2 ft)	0.30	0.55
28.4	5.4 m (17.7 ft)	1.0 m (3.3 ft)	2.5 m (8.2 ft)	1.4 m (4.6 ft)	0.35	0.64
50.5	3.2 m (10.5 ft)	0.6 m (1.9 ft)	1.5 m (4.9 ft)	0.8 m (2.6 ft)	0.60	1.10

Horizontal dimensions for 50 ohm delta loops (with gap), with the centre of the vertical sides longer than the horizontal ones, and the ends of the vertical sides longer than the horizontal ones.

50 ohm delta loops

The 50 ohm loops are close to 1/2 wavelength tall, so the bottoms are relatively close to the ground. Because the ends are higher than the loop, using thicker wire may be a good idea (or alternative the weight and size of the feedline. The width is about 1/8 wavelength, so they take less space than a full wave loop.

Just as the other 50 ohm loops, efficiency is expected to be average when. The use of 2 mm (2400) IFA wire raises the resonant frequency by about 0.5% for the same wire length.

Like the other frequencies loops, bandwidth is relatively narrow – about half of the 2:1 – 1.5 dB. Wire diameter is 2 mm (2400).

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
3.5	170 m (558 ft)	40 m (131 ft)	80 m (262 ft)	43 m (141 ft)	0.016	0.028
3.8	158 m (518 ft)	37 m (121 ft)	74 m (243 ft)	40 m (131 ft)	0.018	0.030
5.1	118 m (387 ft)	27.5 m (90.2 ft)	55 m (180 ft)	29.5 m (96.8 ft)	0.024	0.040
7	86 m (282 ft)	20 m (65.6 ft)	40 m (131 ft)	21.5 m (70.5 ft)	0.031	0.053
10.1	60.7 m (199.2 ft)	14.1 m (46.3 ft)	28.2 m (92.5 ft)	15.2 m (49.9 ft)	0.045	0.075
14.1	43.8 m (144 ft)	10.2 m (33.5 ft)	20.4 m (66.9 ft)	11 m (36.1 ft)	0.063	0.105
18.1	34 m (111.6 ft)	7.9 m (26 ft)	15.8 m (51.8 ft)	8.5 m (27.9 ft)	0.08	0.135
21.2	29.4 m (96.5 ft)	6.8 m (22.3 ft)	13.6 m (44.6 ft)	7.3 m (24 ft)	0.095	0.16
24.9	25.2 m (82.7 ft)	5.9 m (19.4 ft)	11.8 m (38.7 ft)	6.3 m (20.7 ft)	0.11	0.19
28.4	22 m (72.2 ft)	5.1 m (16.7 ft)	10.2 m (33.5 ft)	5.5 m (18.1 ft)	0.12	0.21
50.5	12.8 m (42 ft)	2.9 m (9.5 ft)	5.8 m (19 ft)	3.1 m (10.2 ft)	0.21	0.38

Horizontal dimensions for 50 ohm vertically polarized delta loops (with gap), with the centre of the vertical sides longer than the horizontal ones, and the ends of the vertical sides longer than the horizontal ones.

Data for horizontally polarized delta loops (point down)

Because the ends are higher than the loop, using thicker wire may be a good idea (or alternative the weight and size of the feedline. The width is about 1/8 wavelength, so they take less space than a full wave loop.

Just as the other 50 ohm loops, efficiency is expected to be average when. The use of 2 mm (2400) IFA wire raises the resonant frequency by about 0.5% for the same wire length.

Like the other frequencies loops, bandwidth is relatively narrow – about half of the 2:1 – 1.5 dB. Wire diameter is 2 mm (2400).

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
3.5	170 m (558 ft)	40 m (131 ft)	80 m (262 ft)	43 m (141 ft)	0.016	0.028
3.8	158 m (518 ft)	37 m (121 ft)	74 m (243 ft)	40 m (131 ft)	0.018	0.030
5.1	118 m (387 ft)	27.5 m (90.2 ft)	55 m (180 ft)	29.5 m (96.8 ft)	0.024	0.040
7	86 m (282 ft)	20 m (65.6 ft)	40 m (131 ft)	21.5 m (70.5 ft)	0.031	0.053
10.1	60.7 m (199.2 ft)	14.1 m (46.3 ft)	28.2 m (92.5 ft)	15.2 m (49.9 ft)	0.045	0.075
14.1	43.8 m (144 ft)	10.2 m (33.5 ft)	20.4 m (66.9 ft)	11 m (36.1 ft)	0.063	0.105
18.1	34 m (111.6 ft)	7.9 m (26 ft)	15.8 m (51.8 ft)	8.5 m (27.9 ft)	0.08	0.135
21.2	29.4 m (96.5 ft)	6.8 m (22.3 ft)	13.6 m (44.6 ft)	7.3 m (24 ft)	0.095	0.16
24.9	25.2 m (82.7 ft)	5.9 m (19.4 ft)	11.8 m (38.7 ft)	6.3 m (20.7 ft)	0.11	0.19
28.4	22 m (72.2 ft)	5.1 m (16.7 ft)	10.2 m (33.5 ft)	5.5 m (18.1 ft)	0.12	0.21
50.5	12.8 m (42 ft)	2.9 m (9.5 ft)	5.8 m (19 ft)	3.1 m (10.2 ft)	0.21	0.38

Horizontal dimensions for 50 ohm vertically polarized delta loops (point down), with the centre of the vertical sides longer than the horizontal ones, and the ends of the vertical sides longer than the horizontal ones.

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10.1	31.5 m (103.5 ft)	8.5 m (27.9 ft)	10.7 m (35 ft)	11.5 m (37.8 ft)	0.34	0.20
14.1	22.6 m (74 ft)	6.1 m (20 ft)	7.65 m (25 ft)	8.25 m (27 ft)	0.50	0.30
18.1	17.6 m (57.7 ft)	4.8 m (15.7 ft)	5.95 m (19.5 ft)	6.4 m (21 ft)	0.65	0.37
21.2	15.1 m (49.5 ft)	4.1 m (13.5 ft)	5.1 m (16.7 ft)	5.5 m (18 ft)	0.75	0.45
24.9	12.9 m (42.3 ft)	3.5 m (11.5 ft)	4.35 m (14.3 ft)	4.7 m (15.4 ft)	0.90	0.55
28.4	11.3 m (37.2 ft)	3.1 m (10.2 ft)	3.8 m (12.5 ft)	4.1 m (13.5 ft)	1.00	0.60
50.5	6.39 m (21.0 ft)	1.73 m (5.67 ft)	2.16 m (7.1 ft)	2.33 m (7.67 ft)	2.00	1.20

Nominal dimensions for 75 ohm horizontally polarized delta loops (point down), with the top 1/2 wavelength high.

112 ohm delta loops

The 112 ohm delta loops are close to equilateral, with the top just a little shorter than the sides. These are designed to match to 50 ohm using 1/4 wavelength of 75 ohm coax.

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
1.85	170 m (558 ft)	53 m (174 ft)	52.2 m (171 ft)	58.5 m (192 ft)	0.075	0.045
3.6	87.6 m (287.5 ft)	27 m (88.5 ft)	27.15 m (89 ft)	30.2 m (99.5 ft)	0.155	0.09
5.35	59.2 m (192 ft)	18.8 m (61.7 ft)	17.85 m (58.6 ft)	20.2 m (66.2 ft)	0.24	0.14
7.1	44.6 m (146.3 ft)	14 m (45.9 ft)	13.6 m (44.6 ft)	15.3 m (50.2 ft)	0.34	0.20
10.1	31.5 m (103.2 ft)	10 m (32.8 ft)	9.5 m (31.1 ft)	10.75 m (35.2 ft)	0.50	0.30
14.1	22.6 m (74.3 ft)	7.1 m (23.3 ft)	6.9 m (22.6 ft)	7.75 m (25.5 ft)	0.72	0.42
18.1	17.64 m (57.8 ft)	5.5 m (18 ft)	5.41 m (17.7 ft)	6.07 m (19.9 ft)	0.95	0.55
21.2	15.1 m (49.5 ft)	4.74 m (15.5 ft)	4.6 m (15.1 ft)	5.18 m (17 ft)	1.10	0.65
24.9	12.85 m (42.1 ft)	4 m (13.1 ft)	3.95 m (13 ft)	4.425 m (14.5 ft)	1.35	0.75
28.4	11.3 m (37 ft)	3.6 m (11.1 ft)	3.4 m (11.1 ft)	3.85 m (12.6 ft)	1.55	0.90
50.5	6.4 m (20.95 ft)	2 m (6.55 ft)	1.95 m (6.4 ft)	2.2 m (7.2 ft)	3.00	1.70

Nominal dimensions for a 112 ohm horizontally polarized delta loop with the top at 1/2 wavelength.

200 ohm delta loops

The 200 ohm loops are nearly as wide as a dipole, but with a wider SWR bandwidth: less than 1.5 : 1 from 7.0 to 7.3 MHz. The shape is close to a right triangle, with the right angle at the bottom. I use this design for my 40m **portable loop antennas**, because the wider bandwidth maintains a good match in spite of variations in how it is installed in the trees. Some "as built" dimensions for 40m loops using insulated wire are on the **200 ohm Portable Loop** page.

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
1.85	170 m (556 ft)	66 m (216 ft)	40 m (131 ft)	52 m (170 ft)	0.13	0.075
3.6	87.2 m (286 ft)	34 m (112 ft)	20.5 m (67 ft)	26.6 m (87 ft)	0.27	0.16
5.35	59 m (193 ft)	23.5 m (77 ft)	13.2 m (43 ft)	17.75 m (58 ft)	0.40	0.25
7.1	44.4 m (145.5 ft)	17.2 m (56.5 ft)	10.5 m (34.5 ft)	13.6 m (44.5 ft)	0.56	0.34
10.1	31.3 m (103 ft)	12.1 m (39.7 ft)	7.5 m (24.5 ft)	9.6 m (31.6 ft)	0.85	0.50
14.1	22.5 m (73.5 ft)	8.7 m (28.5 ft)	5.33 m (17.5 ft)	6.9 m (22.5 ft)	1.25	0.70
18.1	17.5 m (57.5 ft)	6.8 m (22.3 ft)	4.15 m (13.5 ft)	5.35 m (17.6 ft)	1.60	0.95
21.2	14.95 m (49.2 ft)	5.85 m (19.2 ft)	3.5 m (11.5 ft)	4.55 m (15 ft)	2.00	1.10
24.9	12.8 m (42 ft)	5 m (16.4 ft)	3 m (9.8 ft)	3.9 m (12.8 ft)	2.30	1.35
28.4	11.22 m (36.75 ft)	4.5 m (14.75 ft)	2.5 m (8.2 ft)	3.36 m (11 ft)	2.60	1.50
50.5	6.3 m (20.7 ft)	2.5 m (8.2 ft)	1.45 m (4.8 ft)	1.9 m (6.25 ft)	5.0	3.0

Nominal dimensions for 200 ohm horizontally polarized delta loops with the top at 1/2 wavelength.

Data for vertically polarized rectangular loops

These vertically polarized loops are most often used on the lower bands to achieve low angle polarization. For that reason, dimensions are only given through 20m, but they can be scaled to other bands if desired. Note that the bottom wire is set at 3 m (10 feet) off the ground (considered a safe height to avoid human contact with the wire): because this isn't defined as a function of wavelength, the dimensions don't scale exactly, and the dimensions are strongly affected by the capacitive coupling between the center of the bottom wire (a point of high impedance) and the ground below it.

Because height is often a limitation, dimensions are only given for 50 and 75 ohm rectangular loops, which are suitable for direct coax feed. Further discussion of the characteristics of these loops is in the **theory article**.

50 ohm rectangular loops

These vertically polarized 50 ohm rectangles have different dimensions than the horizontally polarized rectangles given previously, due to the effect of the ground. Rather than a 2 : 1 ratio of width to height, it is over 4 : 1 on 160m, down to about 2.5 : 1 on 20m, with the bottom wire at 3 m (10 feet) off the ground. There will also be some variation due to ground conditions, so expect to make some adjustments if a precise 50 ohm match is important.

These models are for 1 mm (AWG #18) bare wire. As with the other 50 ohm loops, thicker wire may be a good idea, especially on the lower bands.

Frequency MHz	Wire Length	Width	Height	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
1.85	163 m (534 ft)	67 m (220 ft)	14.5 m (47 ft)	0.035	0.020
3.6	84.8 m (278 ft)	33.4 m (109.5 ft)	9 m (29.5 ft)	0.070	0.040
5.35	57.4 m (188 ft)	22 m (72 ft)	6.7 m (22 ft)	0.110	0.065
7.1	43.5 m (143 ft)	16.25 m (53.5 ft)	5.5 m (18 ft)	0.16	0.09
10.1	30.8 m (100.9 ft)	11.2 m (36.75 ft)	4.2 m (13.7 ft)	0.22	0.13
14.1	22.1 m (68.6 ft)	7.66 m (23.8 ft)	3.2 m (10.5 ft)	0.32	0.18

Nominal dimensions for 50 ohm vertically polarized rectangular loops, with the bottom wire 3m (10 ft) off the ground.

75 ohm rectangular loops

These 75 ohm loops also have different dimensions from the horizontally polarized antennas due to the interaction with the ground.

Frequency MHz	Wire Length	Width	Height	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
1.85	163.6 m (536.5 ft)	61.8 m (202.75 ft)	20 m (65.5 ft)	0.055	0.030
3.6	85 m (278.8 ft)	31 m (101.7 ft)	11.5 m (37.7 ft)	0.105	0.60
5.35	57.8 m (190 ft)	20.4 m (67 ft)	8.5 m (27.9 ft)	0.160	0.095
7.1	43.74 m (143.6 ft)	15.07 m (49.5 ft)	6.8 m (22.3 ft)	0.22	0.13
10.1	31 m (101.6 ft)	10.25 m (33.6 ft)	5.25 m (17.2 ft)	0.33	0.19
14.1	22.39 m (73.2 ft)	7.2 m (23.6 ft)	3.95 m (13 ft)	0.47	0.27

Nominal dimensions for 75 ohm vertically polarized rectangular loops with the bottom wire 3 m (10 ft) above the ground.

Data for vertically polarized delta loops

Delta loops with the point upwards are probably the most common vertically polarized loop, as only one high support is needed. Dimensions are given here for 50, 75, and 112 ohm versions.

In these models, the bottom wire is fixed at 3 m (10 ft) above ground, to reduce the chance of human contact with the high impedance point in the center of the bottom wire. As with the rectangles, this fixed height means that the dimensions don't necessarily scale with frequency, especially on the lower bands.

Dimensions are only given up through 20m, because that will be the most common usage, but the highest frequency design can be scaled as a starting point for higher bands if desired.

The feedpoint for vertical polarization of the delta loops is 1/4 of the Wire Length down one side from the top corner. This puts it close to, but somewhat above, a bottom corner.

50 ohm delta loops

These 50 ohm loops are strongly affected by ground, which has the effect of reducing the required mast height to less than 1/4 wavelength on the lower bands. Bandwidth is a bit wider than for the horizontally polarized loops due to ground losses. Probably the easiest way to adjust them is to raise the wire to the top of the mast, then adjust the total wire length and the positions of the lower corners for a good match at the desired center frequency.

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
1.85	168 m (552 ft)	78.8 m (258.6 ft)	21 m (68.9 ft)	44.65 m (146.5 ft)	0.035	0.021
3.6	87.5 m (285 ft)	40.2 m (130 ft)	12.45 m (40.8 ft)	23.65 m (77.5 ft)	0.075	0.045
5.35	59.1 m (194 ft)	26.7 m (87.6 ft)	9.2 m (30.2 ft)	16.2 m (53.2 ft)	0.12	0.07
7.1	44.7 m (146.6 ft)	20 m (65.6 ft)	7.25 m (23.75 ft)	12.35 m (40.5 ft)	0.15	0.09
10.1	31.6 m (103.75 ft)	13.8 m (45.34 ft)	5.6 m (18.4 ft)	8.9 m (29.2 ft)	0.23	0.13
14.1	22.76 m (74.5 ft)	9.76 m (32 ft)	4.25 m (14 ft)	6.5 m (21.25 ft)	0.33	0.19

Nominal dimensions for 50 ohm vertically polarized delta loop antennas with the bottom wire 3 m (10 ft) above ground.

75 ohm delta loops

The 75 ohm loops are a bit taller and narrower than the 50 ohm loops, with a wider SWR bandwidth. Wire lengths and distance from the top corner to the feedpoint position remain about the same.

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
1.85	167 m (548 ft)	74.5 m (244 ft)	27.5 m (90.2 ft)	46.3 m (151.9 ft)	0.055	0.030
3.6	87.2 m (286 ft)	37.9 m (124.3 ft)	15.75 m (51.65 ft)	24.64 m (80.85 ft)	0.110	0.065
5.35	59 m (193.5 ft)	25 m (82 ft)	11.5 m (37.7 ft)	17 m (55.75 ft)	0.17	0.10
7.1	44.7 m (146.6 ft)	18.7 m (61.4 ft)	9 m (29.5 ft)	13 m (42.6 ft)	0.23	0.13
10.1	31.5 m (103.3 ft)	12.9 m (42.3 ft)	6.7 m (22 ft)	9.3 m (30.5 ft)	0.32	0.20
14.1	22.7 m (74.5 ft)	9 m (29.5 ft)	5.15 m (16.9 ft)	6.85 m (22.5 ft)	0.50	0.29

Nominal dimensions for 75 ohm vertically polarized delta loops with the bottom 3 m (10 ft) above the ground.

112 ohm delta loops

The 112 ohm loops require a taller support, but provide a wider SWR bandwidth than the lower impedance designs. They match to 50 ohms with a 1/4 wavelength of 75 ohm coax.

Frequency MHz	Wire Length	Width	Height	Side Length	2 : 1 SWR Bandwidth MHz	1.5 : 1 SWR Bandwidth MHz
1.85	167 m (548 ft)	69 m (226 ft)	34.5 m (113 ft)	49 m (160 ft)	0.080	0.045
3.6	86.6 m (284.5 ft)	34.6 m (113.5 ft)	19.5 m (64 ft)	26 m (85.5 ft)	0.17	0.10
5.35	59 m (193 ft)	22.75 m (74.5 ft)	14 m (46 ft)	18 m (59 ft)	0.28	0.15
7.1	44.5 m (145.8 ft)	16.8 m (55 ft)	11 m (35 ft)	13.85 m (45.4 ft)	0.35	0.20
10.1	31.5 m (103.4 ft)	11.7 m (38.4 ft)	8 m (26.2 ft)	9.9 m (32.5 ft)	0.50	0.29
14.1	22.6 m (74 ft)	8 m (26.25 ft)	6.1 m (20 ft)	7.3 m (23.9 ft)	0.74	0.44

Nominal dimensions for 112 ohm vertically polarized delta loops with the bottom wire 3 m (10 ft) above the ground.

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