Balcony Antenna

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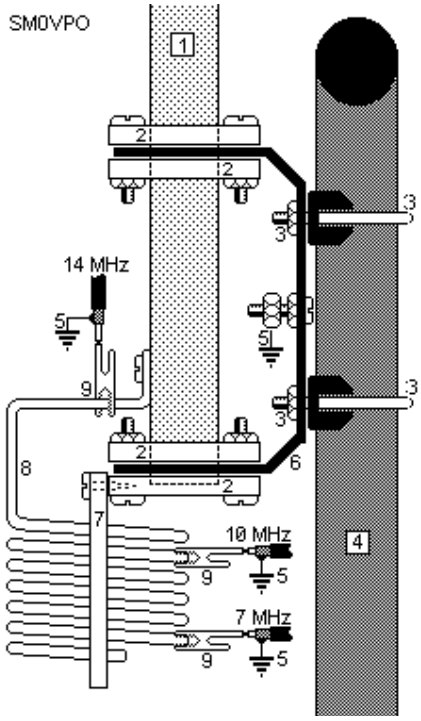
Many amateurs are very restricted with the space they have available for HF antennas. I have documented a short antenna for the HF bands, but here is a simple method of mounting it, and a method of further reducing the physical length. I used to use an old CB (27 MHz) half-wave antenna which had a broken matching coil. this I used as a 1/4 - wave antenna for 14 MHz, after removing the matching coil. Today I find that CB antennas have increased in price, so I have found a cheap replacement that can be fitted to the balcony of apartment dwellers.



THE ANTENNA

Above is the side view of a bracket, which can be thrown together in a couple of hours and gives surprisingly results. I use six sections for the antenna itself, each of which is 1 meter long. Each section fits inside the previous section by exactly 10 cm. the last section is adjusted so that total length of the antenna is 5.35 meters. This resonates at 14.1750 MHz. I used the following aluminum tubes:-

section 1 : 31 mm Dia. Wall thickness = 2.0 mm. (bottom section)
section 2 : 25 mm Dia. Wall thickness = 2.0 mm.
section 3 : 20 mm Dia. Wall thickness = 1.5 mm.
section 4 : 15 mm Dia. Wall thickness = 1.5 mm.
section 5 : 10 mm Dia. Wall thickness = 1.5 mm.
section 6 : 6 mm Dia. Wall thickness = 1.0 mm. (top section)
This is shown as item (1) in the drawing above.

THE BRACKET (6) & (2)

The bracket screws on to a handrail of the balcony. In my present situation I have a 7 meter wide terrace with a horizontal handrail, but there are four vertical steel pipes supporting the handrail. The bracket is screwed on to one of these vertical supports (4). The bracket is formed using 3 - 4 mm thick aluminium plate (6) with a 50 mm hole in the center of the top & bottom ends. Bend the plate in two places to prevent the plate becoming weakened. The two ends are each sandwiched in between two nylon blocks (2). Use a chopping board stolen from the kitchen, if you can get away with it. Otherwise, the chopping boards are available from:
IKEA (Sweden)
WOOLWORTHS (UK)
SAFEWAY (USA)

Drill THREE of the nylon blocks, in the center, to fit the 31mm tube (1). The fourth block (bottom) should be drilled with a 5 mm hole to allow water to run out. The bracket is bolted to the balcony handrail, using 35 mm exhaust (muffler) clamps (3).

THE COIL (7) & (8)

This is used to make the antenna resonate at lower frequencies. I wound all my coils using 4mm aluminum wire, but copper hydraulic brake pipe works as well. The coil is 10mm Dia (the same as a tin of DelMonte pineaple chunks)! The coil pitch is 1cm per turn. I used two pieces of plastic conduit (7) to support the coil.

The coil uses about 1 meter of wire/pipe for every three turns. Flatten one end and drill a hole in it for connecting it to the antenna pole (1). If you use aluminum wire, then shorter pieces can be joined together with a brass insert from a car cable connector. Copper tube can easily be soldered.

FEEDING THE ANTENNA (5) & (9)

Feed the antenna with 50 ohm coaxial cable, braid connected to the bracket (5) and the center conductor connected to an aligator clip. Select the band using the aligator clip (9):-

0 turns = 14 MHz (20 meter band) (VSWR - almost 1:1)

2 turns = 10 MHz (30 meter band) (VSWR - almost 1:1)

6 turns = 7 MHz (40 meter band) (VSWR - about 1.1:1)

51 turns = 3.8 MHz (80 meter band) (VSWR - about 1.4:1)

53 turns = 3.7 MHz (80 meter band) (VSWR - about 1.4:1)

55 turns = 3.6 MHz (80 meter band) (VSWR - about 1.4:1)

57 turns = 3.5 MHz (80 meter band) (VSWR - about 1.4:1)

Here is a photograph of one of the prototypes in my balcony. In the background you can just make out another one of these antennas, but with a bigger (63 turn) coil.

OTHER INFORMATION

The mounting is very rubust, yet the wind resistance is rather low. Both my antennas have stood up to gale force winds; they hardly wobble!! You do not have to use 5.35 meters of for item (1) if you want to work on other bands, such as 18 MHz.

If you intend to use more than 10 watts, then make sure you have a good
1 cm, or more, of insulation between the aluminium pole (1) and the bracket (6).

Have fun with this project. Regards from Harry - SM0VPO **-73!-**

Balcony Antenna Extension

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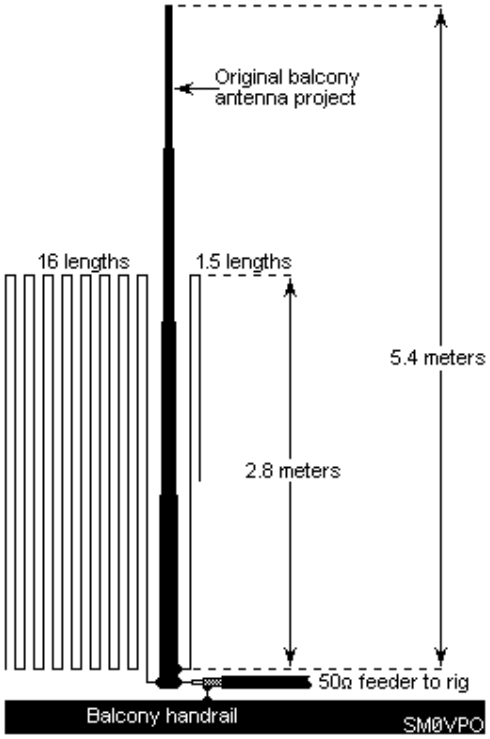
You may have already seen my HF Balcony Antenna which was designed solely for 14MHz, then a coil was added to cover all the lower HF bands (10, 7 and 3.5MHz). Following an article in RadCom I have now extended this antenna to cover all bands from 3.5MHz through to 30MHz without any switching or tuning. The antenna functions using both Fractal and Meander principles. The height of one turn of the loop gives coverage of the 10-meter band, the old balcony antenna covers 20-meters, an extra element covers 17-meters and the 40-meter long meander gives coverage on the 80-meter band. Here is the measured range of the complete prototype antenna:

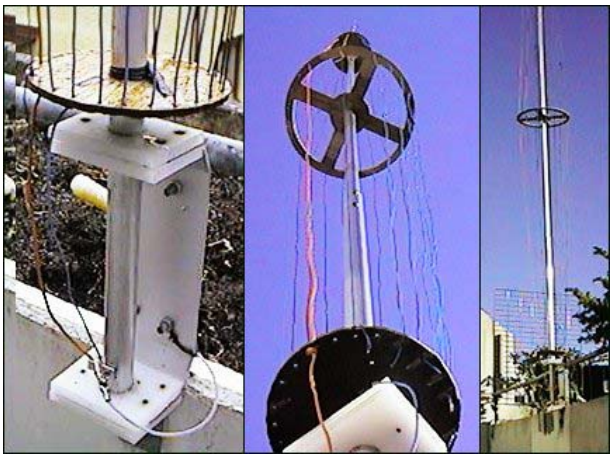
Band	Range (MHz)	Worst VSWR	Center VSWR
80 m	3.55 - 3.70	3:1	1.1:1
40 m	7.00 - 7.10	2.2:1	2.2:1
30 m	10.10 - 10.15	2.3:1	2.3:1
20 m	14.00 - 14.35	1.1:1	1:1
17 m	18.07 - 18.17	1.2:1	1.2:1
15 m	21.00 - 21.45	2.8:1	2.5:1
12 m	24.89 - 24.99	2.1:1	2.1:1
10 m	28.00 - 29.20	3:1	1.1:1

As you can see, the VSWR rises on some of these bands but the antenna is still 100% useable on all

bands without an ASCTU (ASTU or ATU). I have not tested the coverage outside amateur bands, I stopped when the VSWR became 3:1 or when the band edge was encountered. So what is the big secret? I have mentioned before in these pages that several 1/4-wave or 1/2-wave antennas can be placed in parallel and fed with a single feeder. The resonant element will have an effect; the others presenting a high impedance. I tried to add two 1/4-wave antennas to cover the original 14MHz plus 29MHz, 18MHz and 3.6MHz. When I tried it I was surprised that the antenna covered as much as 200KHz of the 3.5MHz band and other HF bands were ALL useable. Reports suggest that the effects on 14MHz have introduced a couple of dB's loss, but that is far less than one "S-point". Here is the drawing of the antenna showing the original 14MHz pole (center) and the other two 1/4-wave antennas I have added.



I have shown a graphic likeness of the routing of the additional 43-meters of wire, they are wound on three plywood disks. The top and bottom disks are 100mm diameter and the center spacer disk is 300mm diameter, each drilled with 18 holes. It would have been better to have used nylon food reparation boards (from Ikea) but I didn't really have all that much confidence this antenna experiment would work so I began with this make-shift arrangement. I must also point out that putting your hand near this antenna will cause changes to the readings, so you may need to make a few minor adjustments in your own individual case. Here are photographs of the finished and working prototype antenna.



The left insert shows the antenna mounted on the old balcony support bracket with the coil removed. The center insert shows a view from the bottom of the antenna. The orange wire is the 420cm 18MHz element. The right insert shows most of the complete antenna from a little distance. Notice how I have cut out material from the center spacer to reduce wind resistance and to help make it look a little less obtrusive for neighbors. The top spacer is identical to the bottom spacer. All three of the elements are connected in parallel at the feed point where I connected my 50-ohm feeder. The old coil is now obsolete and has been removed.

Please note that this antenna idea is also governed by "Harry's Law" of coils:

You cannot wind coils like me and I cannot wind coils like you.

Coil-winding data is a constant that varies from person-to-person.

This means that it may NEED some adjustment in your own environment, depending upon proximity of other artifacts, humidity, groundplane efficiency and even the color of the flag you have fitted to the top of the original 14MHz pole.

Begin antenna assembly by making and fitting the top, middle and bottom spacers. To trim the spacers, temporarily add a 3-meter length of wire, making a small tight loop at the top to remove the surplus. Check the VSWR at 29MHz and adjust the top-spacer position, re-coiling the surplus wire, until the antenna is resonant with VSWR better than 1.5:1. Fix the spacer positions using hose-clamps or whatever other bright ideas you may have. Now remove the 3-meter wire and sew the 40-meters of wire through the holes. Check the VSWR at 3.6MHz, or whatever part of the 80-meter band you want. Remove wire to achieve resonance. Fit the 1.5-loop, 4.2-meter length of wire for the 18MHz element. This loop only comes 1/2-way down the cage, so add some nylon line and secure it to the bottom spacer. Do not tie anything to the center spacer. The wire I used was 7-ampere multi-strand household mains-wiring cable.

Have fun with this project. Regards from Harry - SM0VPO -73!-