SLIM JIM ANTENNA PROJECT

Several designs rolled into one

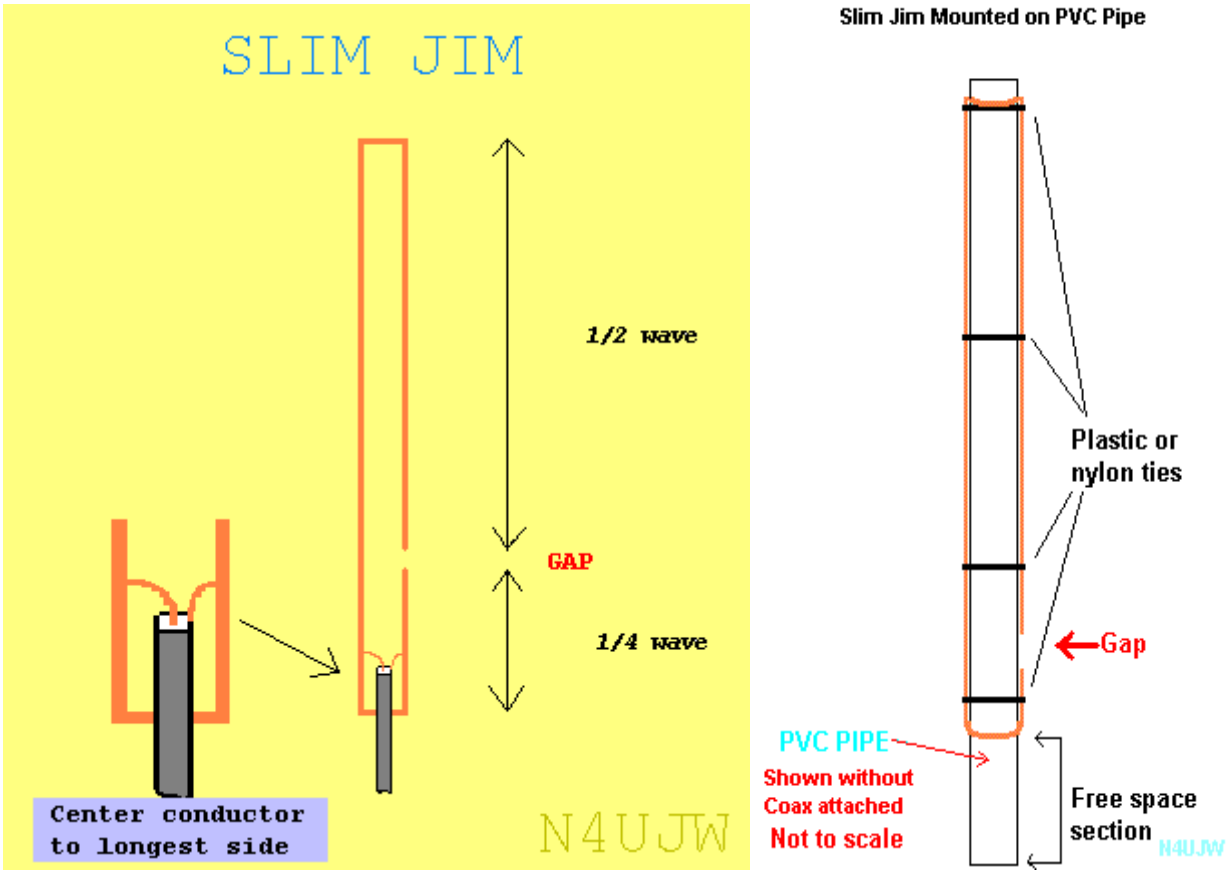
Edited and condensed from various designs

Page updated with new information and videos

The Slim Jim Antenna

The Slim Jim is a vertically polarized omnidirectional end-fed antenna having considerable "gain" and this is concentrated almost parallel to ground toward the horizon rather than skyward making it more efficient than a ground plane type antenna by about 50 percent better. It can be built for almost any frequency!
(Below 10 meters it gets VERY tall)
Due to it's SLIM design, there is very little wind loading.
It is fed with 50 ohm coax.

It uses a 'J ' type matching stub (J Integrated Matching = JIM), hense the name SLIM JIM. Credit for the original design goes to F.C. Judd, G2BCX. Since the vertical angle of radiation is so narrow, about 8 degrees toward the horizon, it usually out performs 5/8 wave or groundplane type construction due to their much higher angle of radiation. It is estimated that the Slim Jim appears to have about 6dB gain over a 5/8 wave antenna due to the extreme low angle of radiation.
(Most of the radiation is directed toward the horizion making the "gain" appear much greater than other vertical type antennas it has been compared to with A/B testing)
Editor's note: There are many gain figures quoted for this antenna and also various descriptions of the actual type of antenna on various websites.
Some have even stated that, "In fact I found it outperformed a 1/2wave over 1/2wave over 1/2wave colinear!"
No matter what you call it, it seems to do an excellent job according to most reports.
What have you got to loose?
Please let us know your results.....email us!
n4ujw AT hamuniverse.com
Using heavy duty construction would make this a good omni repeater antenna.
When correctly matched for lowest swr, it has wide bandwidth.



Drawing on right shown with antenna mounted on PVC pipe

Construction details:

NOTE: NO PART OF THIS ANTENNA SHOULD BE GROUNDED!
It should be totally insulated from it's mount, mast, tower, etc with at least 1/4 wavelength of "freespace" distance. Formulas are provided below for all the measurements including the freespace distance.
The Slim Jim should be constructed from 1/2" copper pipe. Also old tv antenna elements or aluminum tubing could be used with some ingenuity and would be lighter. Experimentation with heavy guage wire supported inside PVC tubing or attached to insulated material such as wood could also be tried and would probally be successful with some ingenuity. 300 ohm twinlead versions also work great!

Using copper pipe, bends are made with soldered 90 degree copper elbows. An adjustable slip sleave made from copper can be added to the element on top above the gap for tuning purposes or possibly some sort of nut, bolt arrangement soldered into the upper end to adjust spacing if needed. (See the 2 meter SSB loop project on this site for better details and pictures of the nut, bolt arrangement.)
Depending on the frequency or band, the average length of the gap and spacing between the elements is 3" at 72MHz and 1" at 220MHz. (See updates below) For 2 meter work this would be around 1 1/2 to 2 inches.
Some experimenters report about 1 inch or less works well. Experiment with the adjustment for best results. The recommended mount is the use of PVC pipe and PVC pipe "T's."

Testing and tuneup:

Support the antenna as high as possible from the ground and other nearby objects especially metal, and fit the coaxial cable to the antenna with some crocodile (alligator) clips. It is suggested that the center conductor be attached to the longest element, shield to the shortest. See diagram above. Attach about 2 to 4 inches up from the bottom and check the VSWR at the design frequency.
USE LOW POWER!
Adjust the clips up or down to get the best match, mark where they are to be finally installed, remove the clips, and solder the coax directly or use clamps, screws, etc. Waterproof or seal all connections and the end of the coax. Use the copper sleeve or nut bolt arrangement, if added, for any necessary tuning.

FORMULAS

(For results in inches)

NOTE: Air gap and element spacing may have to be determined by some experimentation for various frequencies.
See new info about gap spacing below.

(Divide results by 12 for feet)
3/4 wave (longest section = 8415 / fMHz = inches
1/2 wave section = 5610 / fMHz = inches
1/4 wave section = 2805 / fMHz = inches
*** 1/4 wave freespace = 2953 / fMHz = inches**
*** This is the distance that antenna should be from mounting boom, mast or tower.**
Note: These formulas are believed to be accurate.
Some trimming or tweaking of lengths may be needed with YOUR construction!

Slim Jim Metric Formulas:

(For results in meters)
Updated June, 2006
(For results in Centimeters, multiply results by 100)

213.74 / fmhz = 3/4 wave overall length
142.496 / fmhz = 1/2 wave length
71.248 / fmhz = 1/4 wave length
Feed point = About 10 to 20% of 1/4 wavelength (+ - tuning)
75 / fmhz = 1/4 wave "freespace" in Meters
Note: These formulas are believed to be accurate. Some trimming or tweaking of lengths may be needed with YOUR construction!

Some Examples: 2 Meters 146.00mhz

3/4 wave section 8415 divided by 146 = 57.63 inches

1/2 wave section 5610 divided by 146.00 = 38.42 inches
1/4 wave section 2805 divided by 146.00 = 19.21 inches
1/4 wave freespace 2953 divided by 146.00 = 20.22 inches
Feed point about 10 to 20% of 1/4 wave = 1.9 to 3.84 inches (+ - tuning)
The gap would be a guestimate at about 1 1/2 to 2 inches (+ - tuning)
Remember, the 1/4 wave freespace is the distance from the mount as a minumum.

6 Meters 50.150mhz
8415 / 50.150mhz = 167.79 inches
5610 / 50.150mhz = 111.8 inches
2805 / 50.150 = 55.93 inches
Gap spacing 10 to 20% of 1/4 wave = 8 inches (15%)
Freespace mounting distance 58.8 inches

10 Meters 28.400mhz
8415 / 28.4mhz = 296.30 inches (24.69 feet)
5610 / 28.4 = 197.5 inches (16.45 feet)
2805 / 28.4 = 98.76 inches (8.23 feet)
Freespace mounting distance 103.97 inches (8.66 feet)

17 Meters!
A 52 foot vertical including minimun distance from ground!
Hay don't laugh! It might be worth a try for about 6 db more!
Please send us your input if you have suggestions for any band using this antenna!
The lengths will have to be adjusted slightly for the addition of the top and bottom connection points.
See Construction and Testing tips below.

CONSTRUCTION and TESTING TIPS

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The Slim Jim should be constructed from 1/2" copper pipe OR near this size of any conductive material but this is not an absolute! The bends are made with soldered 90 degree copper elbows if your using copper tubing.
A slip sleave or other arrangement can be added to the upper or lower part of the gap made from copper, brass or aluminum for adjustment of the gap measurement for swr tuning, although the average length of the gap and spacing between the elements is 3" at 72MHz and 1" at 220MHz. Some experimentation may be needed for gap distance.

For 2 meters, this would be about 1 1/2 to 2 inches. Here again, this measurement is not extremly critical and the gap, element spacing and element length all interact. The total distance from the top of the gap around the entire length and back to the bottom of the gap should equal about 1.5 wavelengths or in the case of the 2 meter example above about 115.26 inches.
No part of the antenna should be grounded to the tower or mast. The

recommended mount is the use of PVC pipe and PVC pipe "T's."
Make sure the space between the tower or mast and the antenna is one "freespace" 1/4 wavelength. TESTING:
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Stand upright (on a railing or non-conductive object, clear of metal surfaces, drain pipes, etc.) and fit the coaxial cable to the antenna with some crocodile (alligator) clips. Attach about 2 to 4 inches up from the bottom (at 2 meters). It is suggested that the center conductor be attached to the longest element, shield to the shortest and using just enough power to get an swr reading check the VSWR. Adjust the clips up or down to get the best match, mark where they are attached, remove the clips, and solder the coax directly. Seal connections and end of coax! Use the copper sleeve, or other spacing adjustment if added, for any necessary tuning. You may not get that perfect 1:1! The air gap, total length and element spacing all interact.