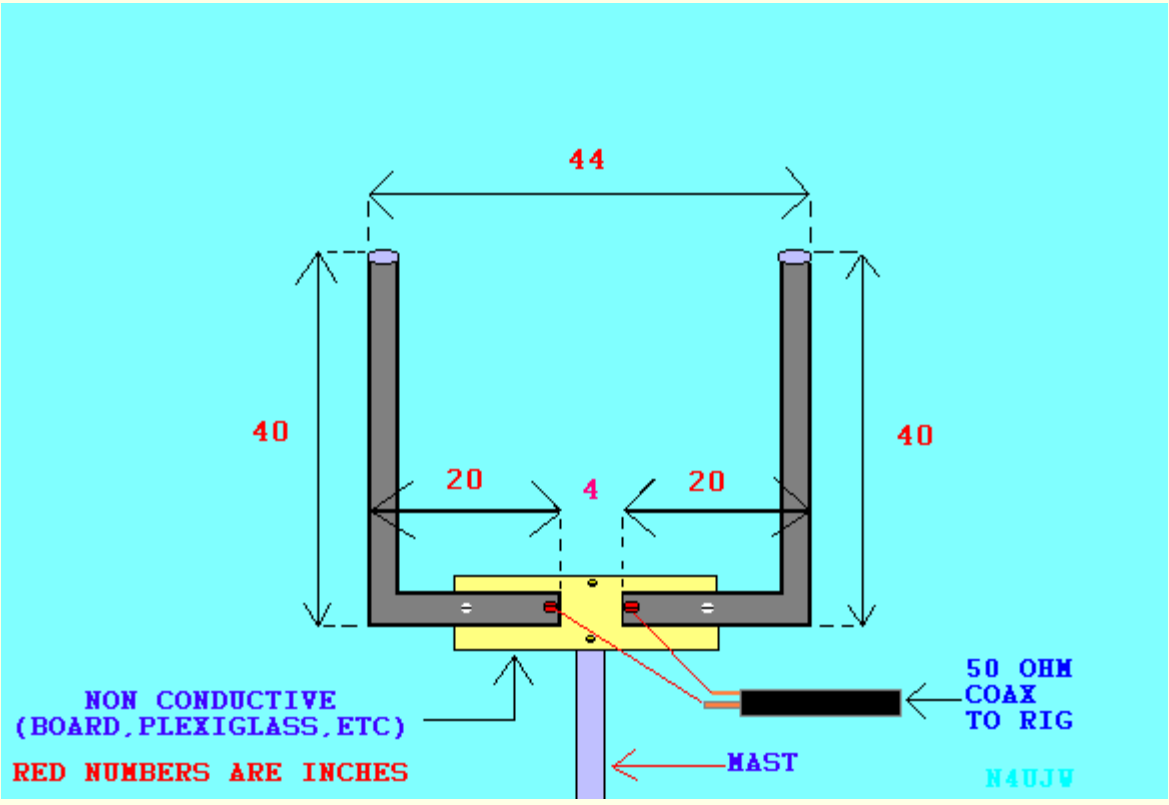
The "Slingshot" Antenna
for 2 Meters

Re-edited by N4UJW from an original article by David Younker
KA8OGD (callsign no longer active)
73 Magazine April 1989

While recently going thru some of my old ham radio magazines, I ran across this inexpensive and easy to build antenna project for 2 meters. I have not seen it on the internet so here it is for you to try!

I personally have not tried this antenna but it should work fine if you follow the very simple directions!

It can be built as is for 2 meters, or you can try it on other bands or frequencies with the formulas provided by me below.



THE SLINGSHOT ANTENNA
NOT DRAWN TO SCALE

Please note in drawing that elements are bent 90 degrees. Make your bends as needed depending on material used for elements. If you use copper tubing, a 90 degree elbow on each should work fine. If

you are comfortable with bending, great, if not, get the hardware store to do it for you!

The completed antenna is bi-directional with a rough figure 8 pattern and is composed of 2, 3/4 wavelength sections of electrical conduit bent and cut to the lengths in the drawing and supported as shown on any type of insulating material attached to the mast with whatever arrangement of bolts, nuts, clamps, etc.
You should note that the bottom (horizontal element portion) is 1/4 wavelength long and the top (vertical element section) is 1/2 wavelength long.
The element mounting plate (in yellow in the drawing) can be plexiglass, painted wood or whatever you happen to have that is NON CONDUCTIVE. You can use copper or aluminum for the active 3/4 wave elements, but aluminum would be prefered due to less weight.
Although electrical conduit comes in various sizes, the size was not stated in the original article but I would suggest 1/2 inch or larger in diameter. (The larger, the greater the bandwidth.)

The total length of each element is 60 inches + - and they are attached about 4 inches apart on the mounting plate with enough bolts and nuts as needed.
The coax attachment points are in red on the picture, and I would suggest that you use spade lugs on the ends of the coax to attach it to the bottom end of each element (the ends nearest the bend) with bolts, nuts and lock washers all the way thru the element and plate. There must be a good electrical connection between the coax center conductor and shield braid and each element. Keep the connections lengths from the end of the coax as short as possible. They become part of the radiating element lengths.

It does not matter which conductor from the coax is attached to which element.
SEAL ALL CONNECTIONS AND THE END OF THE COAX!
When attaching the elements to the mounting plate, drill enough holes all the way thru the elements and plate for good mechanical stability and attach with bolts and nuts. The elements and coax connections must not touch the support mast at any point if the mast is made of metal of any kind! You could use a pvc pipe or length of lumber of the required length instead of metal to get the antenna up as high as possible and a half wave or more is preferred!

"This design, untrimmed, up a half wave, presented an SWR of 1.5:1 across the top 2 MHZ of the band (146-148mhz)".....KA8OGD

A note or two more about experimenting with this antenna:
MAXIMUM SIGNAL IS OFF BOTH ENDS (TO THE RIGHT AND LEFT AS DRAWN NOT BROADSIDE. Point the boom at your target!)
ANTENNA SHOULD BE ROTATED IN DIRECTION NEEDED!

The formulas for calculating the lengths for this project seem to be aproximately the following.
There is a more complicated formula first and then a simple version....take your choice...they both yeild the same result:

11808/freqmhz = 1 wavelength in inches
11808/147.00Mhz = 80.3 inches (using 147.00Mhz)
3/4 wavelength = .75 x 80.3 = 60.2 inches

Simple version formulas:
8856 / freqmhz = 3/4 wavelength section in inches (total element length)
5904 / freqmhz = 1/2 wavelength section in inches
2952 / freqmhz = 1/4 wavelength section in inches

Lets do a calculation for 144.200Mhz ssb using the more complicated version formula:
11808/144.200 = 81.88 inches
3/4 wavelength = .75 x 81.88 = 61.4 inches total element length per side
1/4 wavelength would be = 81.88 / 4 = 20.47inches or 1/3 of 61.4 inches. (The vertical section takes 2/3rds of the total length of one side of the antenna element)
The 90 degree bend will be at the 1/4 wave point on the total length.

Footnote to construction: It is advisable to add about 5 or 6 turns of coax at the base of the antenna as an air choke to help keep rf off the feedline. Some builder do this....some don't.

According to the article, 15 meters is about as low in frequency as it can be used before it becomes very difficult to keep it up due to size and weight! (one element would be about 34.5 feet long according to my Texas Instruments model TI-7140 handheld calculator and the above formulas!) HI!

MODIFICATIONS, COMMENTS AND UPDATES!
Experimentation performed by LA2PJ of Norway taken from his email: (January 23, 2003)

Tonight I have tried a construction from your webpages,
The Slingshot Antenna.
Just soldered two wires to the end of a short length of coax and pinned it to the wall in my shack with small needles to get the correct shape.

The results were amazing! The direction of the wall is in the right direction to a distant repeater here on the west coast of Norway. Using an Alinco handheld with approx 1W, I was able to work through the repeater with full quieting. The distance is 94 kilometers

(approx. 55 miles. The reports indicated that they could not notice the difference when I switched between this indoor antenna and a Diamond X-510 vertical on the roof. The SWR was 1.4:1 at 144MHz rising to 1.7:1 at 146 MHz, indicating that the antenna is a bit long. But then the elements are made of 1mm stranded copper wire. Am thinking of a way to produce the antenna to be used outdoors.

If your offer is still valid, I would like to present this antenna in Norwegian at our web site.

Best 73's
Egil - LA2PJ

(I said yes to his request for adding the project to his site in Norway. Stay tuned here for the link when he gets it up and running for our fellow Norwegian Ham friends to enjoy.)
Editors note: Egil, LA2PJ, is the former Webmaster for the NRRL, the Norway counterpart to our ARRL!

Update from KC2GOA: The two meter slingshot works now that I made some changes. I had to change the spacing between the two elements to 1/2 inch and cut the short lengths to 19 1/4 inches and the long ones down to 39 1/4 inches and I came up with a 1.2 swr at 146.000mhz. 73's KC2GOA.....

[Editors note: The diameter of the elements and the spacing at the center insulator will play an important part in getting the antenna to resonate at your frequency of operation for lowest SWR. Some experimentation may be needed with your particular construction techniques!]

More updates: January 2004
440mhz scaled version by N9YBP CLICK HERE

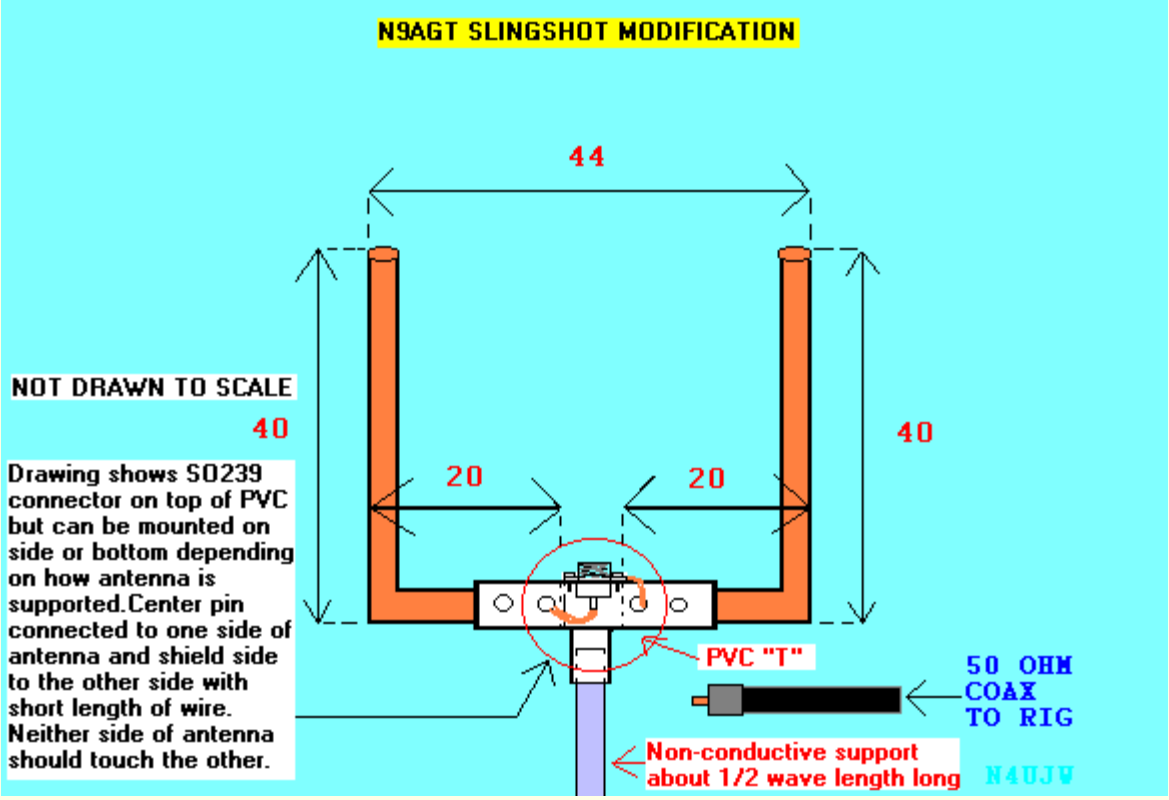
From the editor: I hope you try this antenna project as is and if you are pleased with the results, please let me know,
and if you have tried any modifications to it and they worked a lot better in performance, please email me with them.
I will be glad to add them to this project with full credit going to you!

EXPERIMENT! EXPERIMENT! EXPERIMENT!
(See latest experiments with this antenna and input from builders next below.

MORE MODS FEBRUARY, 2005 BY ROY:
I constructed this antenna as per KC2GOA's latest dimensions. However I added an S0 239 connector between the two elements for direct connection with coax with a PL259 connector.

See drawing below: For the antenna itself. I used the ½" copper tubing AS STATED ABOVE, but for connecting the two sides together, I used a 12" piece of ½" PVC which the copper tubing fit snuggly inside of, and attached an SO 239 connector in the middle.

I mounted the 239 connector on the PVC with a self tapping screw into the GAP between the antenna sides.
I then bolted thru both PVC and copper tubing with brass machine screws and nuts to secure the tubing to the PVC.



To make the connections to the 239 connector, I bore oversized holes into the PVC so that the screw head and nuts would contact the copper tubing. I bought the brass screws long enough - 1 ¼" - so that I could put two nuts on them; one to hold it to the tubing and the other to act as a lug to connect a short piece of bare #14 copper wire to. I then soldered the other end to the 239 connector. I repeated that for the other side. This makes it a neat and clean antenna.
I hung my antenna from the rafters in the attic - upside down!
I use it as my east/west antenna as I already had built the Hentenna antenna that you have on your website for the north/south coverage!
They both work great! If someone wanted to mount this antenna right side up, they would need to put a PVC tee between the sides and point it downward! I used 12" of PVC pipe, but you could use it much longer and add more screws for better support in the vertical position!
73 N9AGT, Roy.

Editors note: Great work Roy! I'm sure there are other ways to attach the coax to the

antenna.....
an MFJ ANTENNA ANALYZER would help in tuning the antenna, but use what you have.....
keep experimenting and have fun!.....N4UJW

440 mhz Slingshot Scaled version
Click Here

The 440mhz Slingshot Antenna Project by N9YBP

Here's the details on the antenna I threw together patterned after the 2 Meter Slingshot and scaled for 440mhz..

The Problem:

I had a mag-mount antenna in my attic and could not reach a 440 repeater to my east.
Even when I went to 35 watts, I still received bad reports. I needed an antenna with some directivity that I could point east. I still wanted to hide the antenna in the attic. I saw the Slingshot antenna project on the Hamuniverse website and wondered if it could be cut
down to 440 Mhz from 2 Meters. I assumed the 2 Meter drawing was for 146 Mhz.
I added 5 Mhz to the repeater out frequency and came up with an ideal, (input), frequency of 449.300Mhz, then I simply scaled the elements as follows,
(This is a neat trick below worth remembering.....Editor)

(146/449.3) x 20 = 6.5 inches (20 refers to original length on 2 meter Slingshot.....Editor)

(146/449.3) x 40 = 13.0 inches (40 refers to original length on 2 meter Slingshot.....Editor)

I reduced the 4 inch measurement between the horizontal legs to 2 inches. I have no logical way to describe how I came up with that. It just looked right on the workbench.

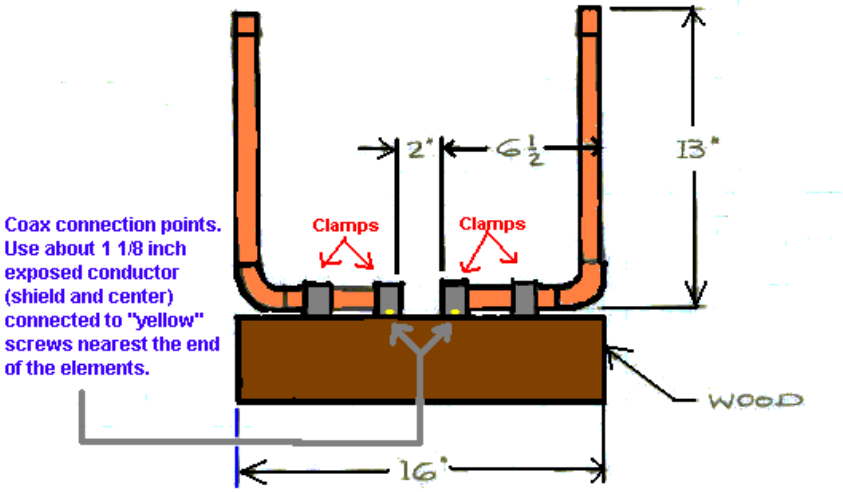
A Parts List:

One (1) Piece of wood, 2" x 4" x 16" long
Two (2) End cap for ½" copper pipe
Two (2) 90 degree elbow for ½" copper pipe
Two (2) Vertical element cut from ½" copper pipe
Two (2) Horizontal element cut from ½" copper pipe
Four (4) Clamps to hold horizontal element to 2 x 4

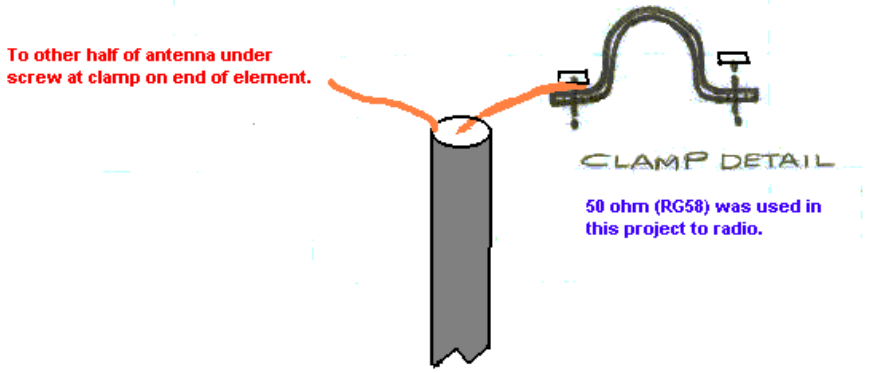
THE END RESULTS!

Construction: (SEE DRAWING BELOW FOR DETAILS)

440 mhz
Slingshot Antenna
by
N9YBP



ELEMENTS: ½" DIA. COPPER PIPE



N9YBP

1. I cut the 2 x 4 to the length of 16". Obviously this is not critical.

2. I cut the elements so that their overall length matched the dimensions on the drawing.
I do not remember the blank lengths.

3. Solder the horizontal element to the elbow and then the vertical element and then the cap on top of the vertical.

4. Mount the elements to the board using four clamps. I purchased these clamps at the same place as the pipe, elbows, and caps.
I had to squeeze the clamps to make them hold the elements to the board.

5. While screwing down the clamps I placed the electrical connections under the innermost screw and made the connections by simply tightening the lugs under the screw.

6. Next I placed the antenna in the attic and ran the coax to the radio room. I tested the SWR and found it to be 1.25.

I did no adjusting or trimming. The antenna worked fine "right from the box".
The repeater of choice was easily hit with only ten watts of power.
Signal reports are good. "This antenna was such a success, it kind of put the fun back into ham radio for me.
That's it. Hope this helps others. Tom N9YBP

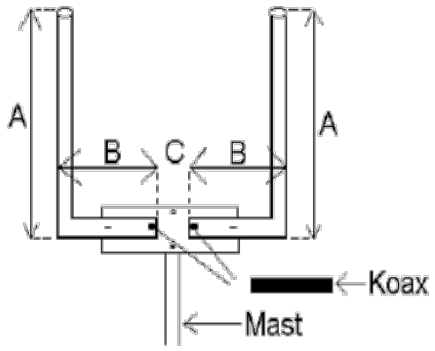
DEUTSCHE GERMAN VERSION:

Einfache Richtantenne für UKW, die „Slingshot-Antenne“
Gesucht wurde eine Antenne, die mit einfachen Mitteln und Montage
unter Dach zuverlässige Verbindungen über entferntere
Relaisfunkstellen ermöglicht, insbesondere für OPs mit wenig Ausgangsleistung und/oder schlechter Antenne; also der typische
Fall, dass jemand mit seinem Handfunkgerät und
Gummiwurstantenne trotz externer Stromversorgung nur über den Ortsrepeater kommt. Die früheste Erwähnung dieser Antennenform
fand in einem Artikel von KA8OGD im '73 Magazine',
April 1989, statt.

Es handelt sich hierbei um einen verlängerten Halbwellendipol,
dessen Enden in einem bestimmten Verhältnis umgebogen sind.
Auf www.hamuniverse.com sind die Maße für die Varianten für
2m und 70cm in inches angegeben. Unten auf dieser Seite sind die metrischen Angaben und auch die Formeln zum Berechnen für
andere Bänder.
Natürlich kann man diese Bauform für andere Bereiche nutzen,
sie wird für Kurzwelle oder auch schon für 6m nur recht unhandlich
und mechanisch schwer zu beherrschen. Die Elemente sind
gleichlang, jeweils ¾ Lambda, berechnet ohne Verkürzungsfaktoren,
und sollten aus möglichst dickem Material bestehen (1 bis 2cm).
Je dicker, desto größer die Bandbreite. Der Abstand im Speisepunkt
ist eher unkritisch. Gespeist wird mit beliebig langem 50-Ohm Koax
direkt. Die Befestigung der Elemente kann nach Fantasie und Zustand
der Bastelkiste des Erbauers erfolgen, der Elementträger darf nur nicht
aus leitendem Material bestehen. Wenn die Antenne im Freien betrieben werden soll muss das Koaxkabel natürlich abgedichtet werden.

Das Richtdiagramm gleicht einer liegenden Acht längs der Ebene der Elemente. Die Richtwirkung könnte durch Hinzufügen von Direktoren
und Reflektoren auf klassische Weise verbessert werden, nur kann
man dann auch gleich eine Yagi bauen... der „Witz“
liegt hier ja in der Einfachheit im Verhältnis zur Größe.

	145 Mhz	439 Mhz
Elementlänge	155	51
Seite A	103	34
Seite B	52	17
Abstand C	11	5



Hier die Formeln:

Wellenlänge: 29.970 / f in Mhz

Elementlänge: Wellenlänge * 3 / 4

Seite A: Elementlänge * 2 / 3

Seite B: Elementlänge * 1 / 3

Abstand C: Seite A / 7 (eher für 70cm) bis Seite A / 10 (eher für 2m), unkritisch

Deutsche Version und Umrechnungen von Kai-Uwe Hoefs, DL1AH, AGCW #2544