

A Moxon Antenna for 220 MHz

Give this simple 220 MHz antenna design a try.

Glenn Morrison, WB6RLC

With the ARRL VHF Contest coming up in June, I thought it would be an ideal opportunity to get some mountain-fresh air, while operating on all bands from 50 – 450 MHz. My Icom IC-706 will provide FM and SSB operation on the 50, 144, and 440 MHz bands. I will use my Alinco DR-235 for 220 MHz FM. I have an M2 6-meter Halo and an Arrow 144/440 MHz dual-band corner reflector, but nothing for 220 MHz. After a bit of research, I settled on a Moxon beam, as it is inexpensive, compact, and easy to build.

Antenna Design

The design is based on the Moxon design calculator (see Figure 1) from <https://ac6la.com/moxgen1.html>, made available by Dan Maguire, AC6LA. The antenna is built using 5 feet of ¼-inch copper tubing, four copper elbows, three 2-inch #8 nylon screws, six #8 nylon

nuts, a 1-inch outer diameter × 12-inch-long section of schedule 40 PVC tubing, a 1-inch PVC cap, a 13-millimeter section of heat-shrink tubing, and a 1- to 1½-inch PVC T, all of which are available at your local hardware store. Only a hack saw, a Dremel tool or file, and a hobbyist butane torch are needed for construction.

Construction

All dimensions are measured from the tubing center to center. The copper elbows add a quarter inch to the overall tubing length, so cut the reflector and director to 18¼ inches to preserve the Figure 1 dimensions. Then cut the director in half, and remove ¼ inch from each piece to provide a ½-inch gap at the feed point. Tin the two tubing sections at the feed point. Sections B and D also need to be shortened to

maintain the overall section E lengths. Spread a little liquid flux on the tubing prior to soldering the sections together. Use goggles, gloves, and work on a non-flammable surface. A simple jig to hold the tubing can be made by drilling a 1/4-inch hole through a piece of 2 x 2 inch board.

To keep the element spacing correct, cut the heads off the nylon screws and install two nuts on each threaded shank. The spacing between the nuts can be adjusted to achieve the necessary gap dimension (see Figure 2). The leftover screw ends fit into the copper tubing and give some additional support. Some clear electrical grade silicon caulk keeps the nuts in place. Cover the entire gap assemblies with several layers of heat-shrink tubing to keep them weatherproof and add strength. I used the same nylon screw technique to maintain the 1/2-inch gap at the feed point.

The main boom is a 12-inch length of 1-inch schedule 40 PVC tube. At one end of the PVC tube (the director end) press on the PVC cap. Near the edge of the cap, drill a 1/4-inch hole all the way through the cap and tube. Take care to ensure that the bit goes straight through the maximum diameter of the PVC tube. Remove the cap and use a Dremel tool or hack saw to cut down to the hole to form a deep notch on both the cap and tube. Next, measure 7.1 inches from this end of the PVC tube and drill another 1/4-inch hole through the tube for the reflector, making sure it is parallel to the holes at the end of the tube. Cut a V-shaped notch in the tube down to the holes for the reflector. Save the cutout. Figure 3 details these PVC tube modifications.

Next, drill a 1/4-inch hole in the boom, feed a length of RG-8X coax through this hole, and solder the RG-8X center conductor and shield to the previously tinned driven element tubes. Then slide the driven element into the slot at the end of the PVC tube (see Figure 4). Drop the reflector into the V, and glue

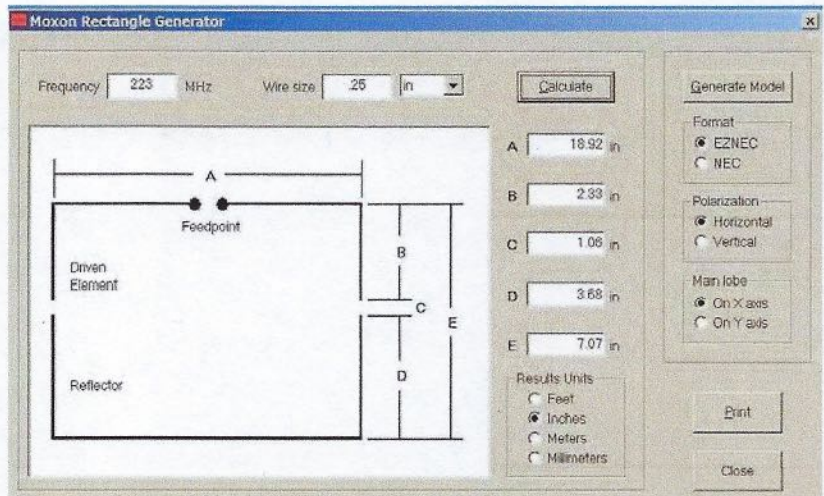


Figure 1 — The Moxon element calculator.

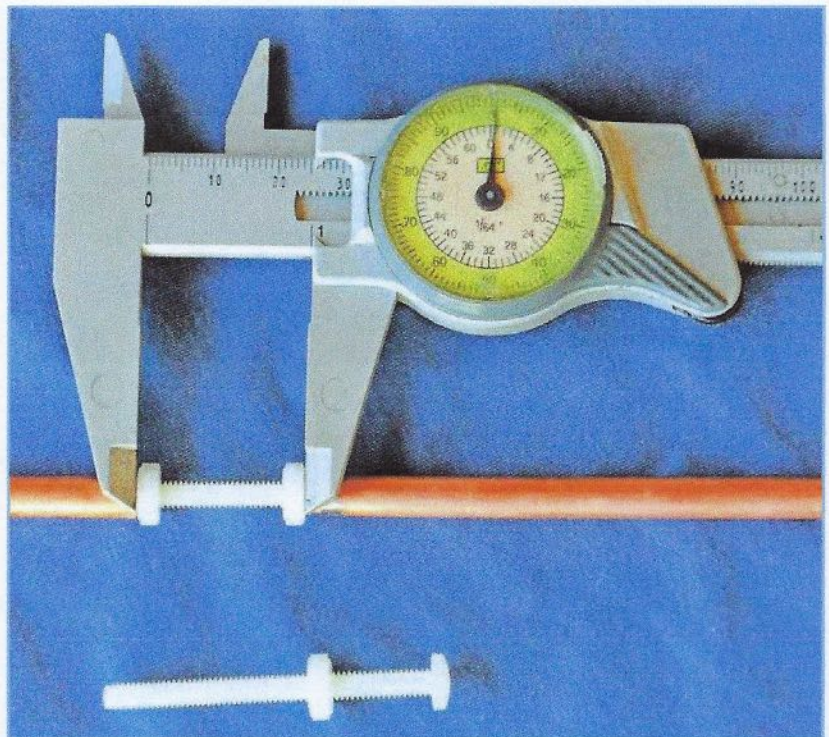


Figure 2 — The nylon spacer details.

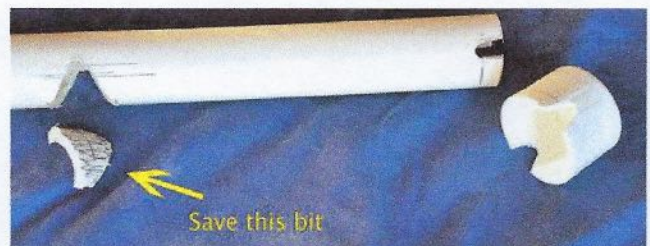


Figure 3 — The general position of the slots cut in the PVC boom.

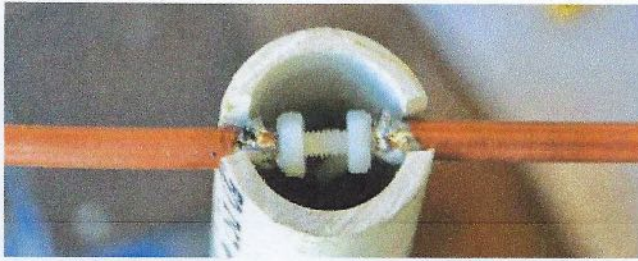


Figure 4 — The driven element installed in the PVC tube.

it to the PVC tube using the previously saved v-shaped cutout. Fill the PVC cap with silicon caulk, and seat it onto the end of the boom. This will hold the driven element securely. Use tie wraps for the RG-8X coax strain relief. Finally, cut in half the 1½-inch section of the 1- to 1½-inch PVC T and fit it to the 1-inch boom. This permits the entire assembly to be hose-clamped to most any mast. The lead photo shows the final 220 MHz antenna.

Results

This Moxon antenna is very broad-banded, and it shows a 1.2:1 SWR over the entire band. These antennas generally have a gain of 5 – 6 dBi with a front-to-back ratio of about 25 dB. It is a compact and portable design, and it weighs just over a pound.

All photos by the author.

Glenn Morrison, WB6RLC, was first licensed in 1966 at age 18. A USMC veteran, Glenn studied electronics technology at Chaffee College, marine science at Orange Coast College, and business at University Redlands. He retired from Parker Hannifin Corp. Aerospace Division, Electronics Research and Development Lab as senior research and development technician and is president of the Desert RATS ARC in Palm Springs, California. An ARRL member, a VE, and an AEC with ARES, Glenn also teaches amateur radio license classes. You can reach Glenn at ticntoc@outlook.com.

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Examiner	Sessions	Accreditation Date	Examiner	Sessions	Accreditation Date	Examiner	Sessions	Accreditation Date
Atlantic			Hudson			Roanoke		
Jobst Vandrey, AC0LP	324	23-Jun-08	Paul Maytan, AC2T	679	06-Sep-84	Judy Friel, AC4RG	292	01-Feb-91
James McCloskey, NS3K	320	14-Nov-94	Stanley Rothman, WA2NRV	467	01-Mar-85	Alan Ronald Moeck, WA2RPX	264	27-Sep-94
Edward Genoino, WA2NDA	298	10-Jul-85	E. Drew Moore, W2OU	449	01-Aug-90	David Snyder, W4SAR	250	01-May-93
George Brechmann, N3HBT	282	01-Apr-91	Fritz Boigris, KB2O	437	26-Oct-84	Sheila Frank, KT4YW	221	30-Oct-96
William Klepser, Jr., WB2AIV	215	09-Jun-99	Gerald Miller, Jr., AA2ZJ	402	05-Dec-95	Terry Sanner, WV8V	217	06-Sep-84
Central			Midwest			Rocky Mountain		
Ed Wagner, AB9FN	361	01-Jul-02	David Bartholomew, AB0TO	730	22-Mar-02	Robert Hamilton, N0RN	392	19-May-87
Allan Bukowski, N9ZD	320	01-Jun-92	Kevin Naumann, N0WDG	642	17-Nov-02	Jeffrey Weinberg, W0QO	302	01-Apr-93
Eldon Boehm, NK9U	316	21-Nov-86	Harry Steger, Jr., W0HMS	568	26-Aug-08	David Avery, N0HEQ	301	13-Jan-88
Donald Hlinsky, N9IZU	308	01-Mar-91	Roland Kramer, W0RL	529	21-Jun-01	Donald Baune, AC0EX	259	19-Sep-06
Timothy Pechtold, AA9BV	277	01-Nov-92	Jeanette Nordman, AB0YX	460	21-Aug-03	David Sharpe, K10HG	257	02-Feb-98
Brian Eder, WB9UGX	277	01-Jan-92	New England			Southeastern		
Dakota			*Bob Phinney, K5TEC	1,065	20-Jan-14	**Gary Lee Pike, KA4KBX	2,279	03-Sep-09
Jeffrey Goodnuff, W0KF	310	17-Jun-03	Paul Lux, K1PL	619	25-Jan-85	*Collin Pike, KJ4AXB	1,360	26-Apr-11
Joe Lowenthal, WA4OVO	309	26-Oct-94	Robert Beaudet, W1YRC	391	01-Aug-90	*Justin Lee Pike, KJ4AXF	1,280	12-Nov-12
Shep Shepardson, N0NMZ	259	12-Mar-01	Bruce Anderson, W1LUS	343	11-Feb-88	*Ryan Krenzschek, W4NTR	1,216	04-Jan-13
Daniel Royer, KE0OR	239	01-Jul-91	Lawrence Polowy, KU1L	338	02-Jan-85	*Anna Grogan Pike, KD4PCU	1,210	18-Aug-09
Dennis Ackerman, KB0OQQ	221	15-Jul-96	Northwestern			Patrick Wyatt Pike, KJ4AXD	945	13-Oct-15
Delta			Richard Morgan, KD7GIE	450	11-Aug-00	Southwestern		
Monvel T. Maskew, Jr., K9FQ	286	18-Jul-18	Loren Hole, KK7M	381	06-Sep-84	*Bill Martin, A10D	1,065	01-Nov-84
Arthur Parry, Jr., WB4BGX	270	01-May-91	S. Riley McLean, W7RIL	305	02-Sep-99	Fred Bollinger, AB7JF	538	17-Apr-95
Joe Lowenthal, WA4OVO	256	25-May-06	David Brooks, N7HT	303	10-Jun-87	David Morrill, N7TWT	440	20-Jul-00
Roger Gray, N5QS	238	01-Mar-93	Scott Robinson, AG7T	303	01-Aug-91	Bruce Ziemienski, WA6BZ	321	25-Mar-02
Bobbie Williams, W1BEW	224	01-Jun-92	George Ftikas, N7TQZ	302	01-Dec-92	Richard Buck, KC7OCT	312	21-May-97
Great Lakes			Pacific			West Gulf		
David Potter, KE8OHG	438	03-Jun-20	Morris Jones, AD6ZH	484	27-Nov-01	*Franz Laugermann, K3FL	1,044	01-Dec-91
Charles Hall, W8HF	286	01-Jun-92	Dieter Stussy, KD6LVW	424	27-Jan-94	Daniel Quigley, N7HQ	630	24-Apr-20
Archie Mack, Sr., AF4EB	231	19-Aug-97	Gordon Fuller, WB6OVH	353	06-Sep-84	Gerald Grant, WB5R	485	04-Jan-85
Dale Pritchett, KC8HJL	223	26-Mar-98	Bill Nichols, NN7K	336	01-Sep-93	Adolph Chris Koehler, K5VCR	476	29-Sep-95
Christian Anderson, Sr., K8VJ	220	09-Feb-90	Jim Brunk, N6BHX	285	13-Jul-95	Wilbert Cannonier, KK5JJ	469	03-Nov-95

*Denotes participation in more than 1,000 sessions.

**Congratulations to Gary Lee Pike, KA4KBX, from Roanoke, Alabama (Southeastern Division), the first VE to reach participation in 2,000 sessions!