Pioneer Amateur Radio Association

P.O. Box 301
Glenville, WV 26351

ParaPhrase

President corner . . .

Wow! I can't believe that this month has gone by so quick. I hope everyone is getting outside projects completed and ready or not summer is here. As I am sure you are aware, there are plenty of amateur radio activities to spend any time that you may have on. If you are into contests there is some type of contest going on every weekend on the HF bands. One coming up is the WV QSO party slated for Saturday June 16, 2018 from 1600Z through 0200Z Sunday June 17, 2018. And of course field day is always the last full weekend in June so this year it will be on Saturday June 23rd & 24th. We as a club do not plan on participating as a group this year. Hopefully we will organize something next year.

If you would like to host something from your ham shack and invite a few club members, mention it on a Monday net. I am sure someone would like to visit while seeing your station. You might have a setup that could benefit others. Field day is always a good time to see each other and chat a while if nothing else.

On a personal note, I am getting closer to getting the new 2 meter repeater on the air in Preston County. The repeater pair has been coordinated with the frequency of -146.82. The pl tone will be the same as 5.29 machine 91.5. The repeater is built, the antenna will be delivered tomorrow and have received formal permission to use the tower site. The ground elevation is 2,567 feet and looks like the antenna will be mounted at about 320 feet. Do, I think the coverage should be pretty good. Next week, I am meeting with the tower coordinator to finalize everything and then I will order feedline and find someone to do the climbing and install the antenna. I hope to have it on the air somewhere around the 1st of July. The last step will be to add a link radio to link both repeaters together. Kind of exciting huh? I am getting excited! I am looking forward to finishing the project and seeing how well the two machine work together. It will be great to keep in touch with everyone again. We should have the opportunity to make some new ham friends ask well. I am talking up amateur radio as much as I can, and have a few that are interested in taking a class. If you know anyone who may be interested in becoming an amateur, please let me know. We may not start a class until September or so, but lets talk it up and see if there is any interest.

73 - Ed N8OYY

Upcoming Events

June 2nd - West PA ARRL Convention - Prospect, PA
July 1st - Somerset County PA Hamfest - Somerset, PA
August 18th - Tri-State ARA Hamfest - Huntington, WV
August 24th - WV State ARRL Convention - Weston, WV
September 1st - PA State ARRL Convention - Uniontown, PA
September 9th - Butler County ARA Swapfest - Butler, PA
September 22nd - Coal County ARA Hamfest - Madison, WV
October 13th - Parkersburg/Wood Hamfest - Mineral Wells, WV

Local VHF repeaters

-145.29 WB8WV (91.5) - Glenville
-145.45 N8LGY (107.2) - Grantsville
-145.39 N8MIN (No pl) - Weston
-146.655 K8VE (123) - Flatwoods
-146.85 K8VE (103.5) - Buckhannon
+147.030 N8ZAR (103.5) - Buckhannon
+147.06 W8OO (103.5) - Crawford
+147.300 WV8RAG (107.2) - Pennsboro

Pioneer Amateur Radio Association Meeting - April 14, 2018

Members present: Eugene Allen KG8KQ, Ed Messenger N8OYY & Steve Ostaff AB8CR

No treasurers report was presented due to Edsel being absent.

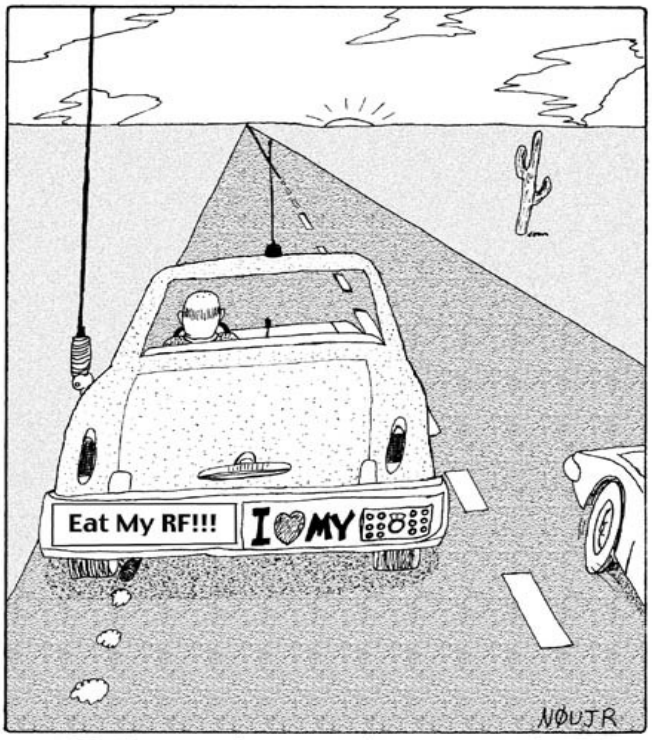
This meeting was informal due to the number of members who attended. Ed Messenger mentioned that he and Eric KD8JPE accomplished at the repeater site earlier in the day. The output of the repeater was increased from about 7 watts to 60 watts. Everyone should see a big improvement.

Ed also mentioned that he had heard that the President of the ARRL will be attending the WV State ARRL Convention this year at Jackson's Mill. Dan Ringer, WV Section Manager is requesting all clubs to encourage as many amateurs as possible to attend the Convention to show a large support for him and to listen to his presentation. The Date of the Convention is August 24th. The time for his presentation will be released closer to the event.

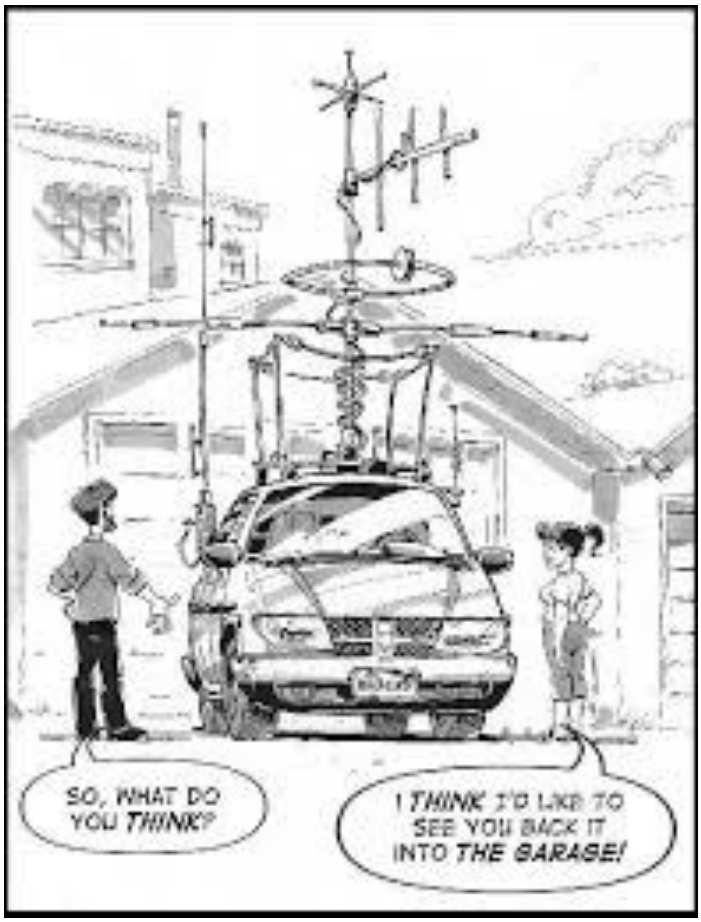
Ed, mentioned that he will be out of town this year during the weekend of Field day. Steve suggested that the club should participate in Field day. Currently there is no plan to participate as a group.

Otherwise no club business was done.

Ed Messenger, N8OYY
President



QCWA members with an attitude...



AMATEUR RADIO

2-Meter and 70-Centimeter Antenna

for High-Altitude Balloon Experiments

This compact, circularly polarized antenna can be used for satellite reception as well.

Axel H. Lehmann, DG3AL*

The German Amateur Radio Club, DARC, takes part in the "Science Days" held at the Europa-Park theme park in Germany. The event is meant to show youngsters the possibilities of education in science and technology. For 2016, we planned two launches of high-altitude balloons.

I was asked to select and build an appropriate antenna for the project. We needed a 2-meter antenna to send data, and a 70-centimeter antenna to send pictures from a camera to Earth.

Antenna Selection

An appropriate antenna for balloon experiments should radiate more or less uniformly over large areas of the ground. Hemispherical coverage would be ideal. Circular polarization is optimal for transmission from moving objects in space because it avoids the fading problem. Publications of other experiments describe several types of antennas. An interesting form of turnstile antenna was described by L. B. Cebik, W4RNL (SK), in *QST*.[1] Two crossed-Moxon antennas are used as a turnstile antenna, resulting in a very compact design (see the lead photos).

Antenna Design

W4RNL described separate antennas for 2 meters and 70 centimeters. To make this design even more compact, both antennas could be combined into one array. To achieve this, those two antennas were rotated 45° with respect to each other. Because the reflector element can be grounded in the middle, both antennas can be connected together at this point. This leads to a compact and elegant structure.

This combination of antennas was simulated in the *MMANA* (**www.gal-ana.de/basicmm/en/**) antenna analyzing tool, and the antennas were found to have little influence on each other. Models for *MANNA* and *4nec2* NEC simulations are on the **www.arrl.org/qst-in-depth** page. Both antennas were designed for an impedance of 50 Ω. The radiation characteristics are appropriate for the purpose.

***Honorable Mention in the 2017 *QST* Antenna Design Competition, 6 Meters and Higher Frequencies category**

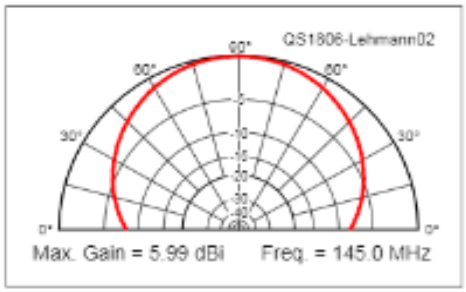


Figure 1 — Far field elevation pattern in the 2-meter band.

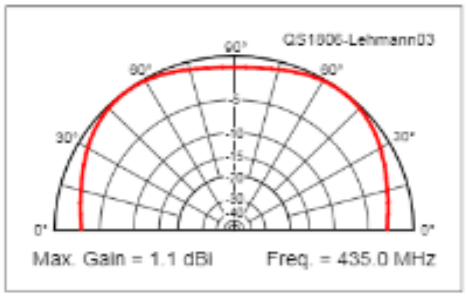


Figure 2 — Far field elevation pattern in the 70-centimeter band.

The 2-meter antenna (see Figure 1) delivers a 6 dBi gain at the peak, and 4 dBi at 40° off the main axis. The azimuthal pattern is omnidirectional. The 70-centimeter antenna pattern is similar and also shows the desired radiation pattern (see Figure 2). The azimuthal pattern is within a few decibels of omnidirectional.

Putting It Together

The construction had special requirements so that the antenna would be as light as possible. A U-profile PVC framework covered with adhesive aluminum foil was used for suitable stability and minimum weight. The completed antenna including the cables weighs only 320 grams. See the "Materials" sidebar for more details.

The elements were built from 7.5 × 1.5 millimeter U-profile PVC stock from a hardware store. The elements were cut to size with a saw in a miter box, the glued with PVC cement. The corners were stiffened by PVC pieces (see Figure 3). Note that the PVC cement sets fast and needs to be handled quickly. Antenna dimension are given in Table 1, and the structure is shown in Figure 4.

First build the frame. Then laminate the frame with aluminum foil. My aluminum tape was 50 millimeters wide (about 2 inches), so I cut the width in half. This width fit perfectly around the U-profile. Let the tape be longer than necessary, then cut it back to size. The tape must be soft aluminum foil, not aluminized plastic.

Cut the finished frame in the middle to connect all the elements. The elements are screwed together with M3 screws (⅛ inch). The connecting elements are made from copper-clad GRP of 30 millimeter × 30 millimeter size (1.2 × 1.2 inches). All reflectors are mounted onto one plate (see Figure 5) and connected. The radiators are mounted onto plates that allow the connection to the coax lines (see Figure 6). A section of 8-millimeter (5/16-inch) diameter PVC tubing stiffens the antennas in the middle.

Materials

6-meter (18-foot) length of PVC U-profile 7.5 mm × 1.5 mm

1-meter (3-foot) length of PVC tube, 8 millimeters in diameter

5 meters (15 feet) of self-adhesive aluminum foil

3 pieces 30 mm × 30 mm copper-clad GRP

2-meter length of RG-179

2-meter length of RG-316

2 SMA male plugs for the feed-point cables

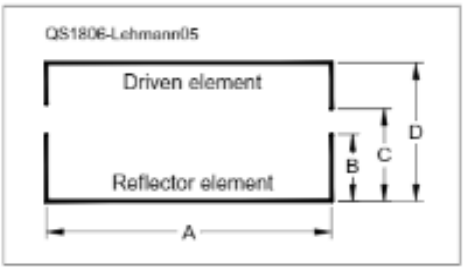


Figure 4 — Structure of the Moxon antenna; dimensions are in Table 1.

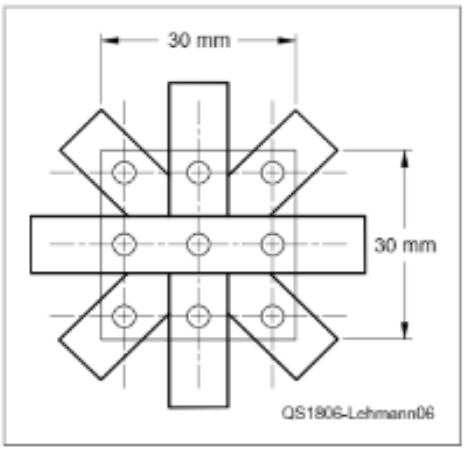


Figure 5 — Copper-clad 30 mm × 30 mm GRP mounting plate for the reflectors.

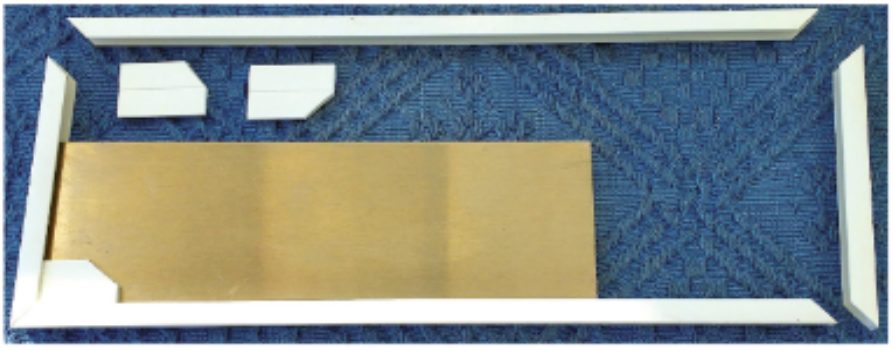


Figure 3 — Antenna frame during assembly. [Axel H. Lehmann, DG3AL, photo]

Table 1

Moxon antenna dimension, millimeters

	A	B	C	D
2 meters	720	147	170	270
70 centimeters	252	46	67	94

Moxon antenna dimension, inches

	A	B	C	D
2 meters	28.35	5.79	6.69	10.63
70 centimeters	9.92	1.81	2.64	3.70

Table 2

Delay Line Cable	Length [mm]	Transformation Line Cable	Length [mm]
RG-316	360 (for 2 meters); 120 (for 70 centimeters)	2 × RG-179 parallel	360 (for 2 meters); 120 (for 70 centimeters)

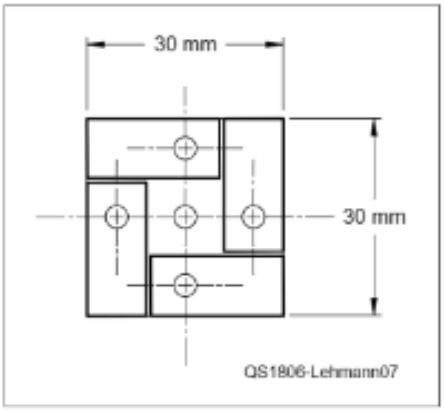


Figure 6 — The 30 mm × 30 mm mounting plate for the feed points and radiator elements.

> *"Two crossed-Moxon antennas are used as a turnstile antenna, resulting in a very compact design."*

After the mechanical structure is completed, the radiators should be connected. A right-hand circular polarization will be generated. Therefore, one radiator is connected directly, and the other is fed via a 90° (quarter-wave) delay line. Now we have two radiators of 50 Ω in parallel on each band, which results in feeding impedance of the antennas of 25 Ω. This impedance can be transformed to 50 Ω by two paralleled quarter-wavelength coaxial cables of 75 Ω. In the "Technical Correspondence" column from the October 2001 issue of *QST*, L. B. Cebik[2] gives a detailed description.

Use RG-316 (50 Ω) and RG-179 (75 Ω) for the cables. Be careful with the RG-179 coax because the inner conductor is very thin. Table 2 lists the length of the impedance-transforming cables with a velocity factor of 0.70. If coax with a different velocity factor is used, the length must be re-calculated with the appropriate factor.

When connecting the cables to the antenna, it is important to cut and solder inner and outer conductor to the same length to preserve symmetry, especially at 70 centimeters. Any asymmetric cabling leads to a poor match. We did not observe any problems in the practical use of the antenna.

Practical Results

The antenna was measured first as a single dipole, then as a cross-dipole, and finally as the completed structure. The impedance was measured using a professional instrument, Chauvin Arnoux ORITEL RO600. We measured less than 1.3 SWR in 144 – 146 MHz, and less than 1.5 SWR in 430 – 440 MHz.

We trusted in the simulations for radiation patterns. After launching the first balloon on October 13, 2016, in Rust, Germany (grid locator JN38ug), I received an e-mail from Sebastian Krauss, DL1ESK, in Viersen (JO31eg) listening to the 2-meter data stream. "I received the signal of your balloon mobile and stationary with 9+++. The very best signal I ever heard from any balloon!" The transmitter output was just 100 mW and the distance was more than 350 kilometers (217 miles).

A receiving station was set up at the launch site in Rust, so spectators could follow the flight on a wall-screen. For receiving, we used a seven-element 2-meter Yagi and a five-element Yagi for 70 centimeters. The signals of the balloon were received until shortly before landing near Stuttgart at the river Neckar (JN49oa).

A German language version of this article was published[3] in *Funkamateur*, March 2017.

Notes

[1]Cebik, L.B., W4RNL, "A Simple Fixed Antenna for VHF/UHF Satellite Work," *QST*, Aug. 2001, p. 38.
[2]Cebik, L.B., W4RNL, "Regarding 'A Simple Fixed Antenna for VHF/UHF Satellite Work' (Technical Correspondence)," *QST*, Oct. 2001, p. 78.
[3]Previously published as, "Leichte 2-m- und 70-cm-Antenne tor einen Stratospharenballon," *Funkamateur*, Mar. 2017, pp. 250 – 251.

Axel H. Lehmann, DG3AL, was first licensed in 1968 when he began studying communications engineering (Nachrichtentechnik) at the Technical University Berlin. After his Dipl.-Ing. exam, he quit Amateur Radio in 1975, but started all over again with a CEPT class 2 license, DG3AL, in 2003. He retired in 2013 after 40 years working in the aerospace industry as project manager for navigation systems. Axel operates mainly SSB phone on 40 meters and up, and FM locally. His main interest is homebrewing and antenna design. Axel is engaged in training and educating newcomers at his hometown's DARC A05 Club in Freiburg, Germany. He can be reached at dg3al@darc.de.

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