Some Serious QRPP Work and Some Serious QRP Antennas

This sunspot cycle has been rather puny, and as many of us know, it is shaping up to be of the "double hump" variety with neither of the humps amounting to much more than a hill of beans. But recently there's been some life in the old girl. To take advantage, I've kept my radios tuned to the higher bands, hoping to run across some gems. One afternoon a few weeks back, one little gem dropped into my lap in the form of AA9AA, Mike Willman of Manitowoc, Wisconsin. Mike was calling CQ on 28.060 and while his signal wasn't meter-bending here on the West Coast, it had a little steam behind it. A fairly steady S6. I gave him a call with my mighty 5 watts, only to find out that he was using his W7ZOI-designed Micro Mountaineer running a battery-saving 600 mW. I have the same rig gathering dust in a drawer (well, it was gathering dust until this encounter) and felt rather embarrassed for resorting to running a "QRP Gallon" when a meager half-watt would have gotten the job done. I dropped my power to 1 watt and we continued in QRPP mode for 20 minutes.

Mike sent along some photos of his shack. I've included one of them (Photo A). The others contain such items as a couple of DX-60s and other QRO stuff such as an SB-220, clearly not of QRP interest, but they show that Mike is certainly a man of many interests.

Here's Mike's description of his rigs: "My QRP rigs are a Norcal 38 Special (first rig I built), 2 Tuna Tin 2s, one in a tin and the other with 6 xtal-controlled frequencies fed into a Miniboots amplifier at 1.5 watts, an OHR 100a 40m (use it mostly as a receiver for my Tuna Tin); a Fox 3 500-mw, 20-meter in the Altoids® mint can. Below that (in the photo) is a Tin Ear 40-meter receiver (which is way too wide for QRP work); and a Small Wonder Labs SWL 20-meter, 2-watt which is a super rig ... The rest is my other HF stuff. I was given a non-working DX-60 with VFO, got them working and use them once in a while with the SB301. Love the smell of warm tubes!"

Mike noted that he's earned DXCC and WAS with his 38 Special! Time out, more information needed. Thinking back to the early days of the 38 Special, I believe it holds the distinction of being one of the most modified rigs ever. Many people bought them, and many had problems and kinks which had to be worked out. I asked Mike for some more details.

"I built the 38 special in 1997," he replied. "I saw it in CQ magazine and thought for $25 dollars I could afford it as an entry level rig to build. It went without a hitch and gave me the confidence to do more..."

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Photo A. AA9AA's shack includes a nice collection of QRP rigs, both commercial and homebrew. See text for a description. Can you guess which one has DXCC under its belt?
building. My antenna was a sloping dipole at about 20 feet so lots of stateside but very little DX. Then we built a new house in 1999 and set up the same antenna in an inverted ‘V’ fashion at 40 feet and man, did the DX come after that! I have so far about 117 DXCC countries ... Worked 7 Europeans with my Micro Mountaineer this morning. I have about 37 countries with it.”

I’m still having trouble taking this all in. The Micro Mountaineer is a crystal-controlled transceiver. You can reverse the RX offset, so technically it will transmit on two different frequencies. Mine puts out 28.060.8 and 28.061.8 MHz. Not a big difference. But it’s basically crystal-controlled at a half watt. I can see where this might be possible when 10 meters is open, but it still represents a giant effort. He’s not operating down in the DX-rich bottom end of the band, but when 10 is open you can work the world on a wet noodle. DXCC on the 38 Special is an entirely different ballgame, starting with the fact that the rig plays on 30 meters, is crystal-controlled and puts out a couple watts. This accomplishment falls into the class called “Herculean Effort” (Not to mention WAS, which also is not a trivial undertaking). Very well done, Mike!

A Visit to Buddipole

Most of the antennas here on the N6GA Radio Ranch are of the homebrewed variety. The exception is a Cushcraft beam, everything else being fashioned from wire. That includes the portable antennas. All manner of EFHWAs, dipoles, center-feds, end-feds, you name it, I’ve built it. And most of these antennas require something to hold them up, such as a tree. The local mountains offer plenty of trees, but occasionally I’ll go to a place where there are no antenna supports readily available. This calls for a different solution, something like a tripod with a fishing pole. These work well when you’re going to set up operations near your car or at a picnic table, but they’re cumbersome to carry any distance.

This year at Field Day, one of my cohorts, Keith Clark, W6SIY, pulled out his Buddistick to do a quick setup so he could QNI (check in) to the QRP Western States Net Saturday morning before the contest. I was impressed with the quality of the Buddipole parts and with the speed of setup. He clamped the base to a picnic table, screwed together the various parts and would have been on the air in a matter of a few minutes if it hadn’t been for an intermittent piece of coax.

After Field Day, I logged on to the Buddipole website <http://www.buddipole.com/> to try to get a handle on what their different offerings were. The original Buddipole is a dipole and the Buddistick is a vertical. You can order a basic or deluxe version of each. Or you can get on the Accessories page and order up separate pieces and parts to roll your own, but I quickly found myself lost because there were so many pieces and parts that it didn’t really make sense. One thing that did make sense was that Buddipole’s digs are in Hillsboro, Oregon, which is roughly where my sister lives. We had planned a trip to visit her family in September, so I scheduled a visit to the Buddipole plant while we were there.

The plant occupies a couple of units in an industrial park. Vivian answers the phone; Jerry, N7THL, and Ken (no call yet) do the hands-on work out back, and Chris, W6HFP, the owner lurks in the office when he isn’t out field-testing his products (Photo B). Or road testing them. Literally. The previous day he’d been out in the parking lot backing over some of his Versa-Tees with his SUV to make sure they were up to spec! Jerry started my tour by digging into the parts bins so he could lay out the bits necessary to make up the various antennas they sell. I’m a visual/tactile learner so this approach made all the difference to me. Chris pointed out that many of the new products they sell are the direct results of customer input. This includes such items as the capacitive hat that can be used to load a shortened vertical, or the bits that can be assembled to make Yagis for 10 and six meters. A bit overwhelming but once I had the principles in mind, it was easy to see how the products have developed over time. Most people start out by buying a packaged...
Buddipole or Buddistick and then start in on the customization process with all the other available parts. I came away with a Buddistick vertical and spent the next few days getting a feel for how it went together, how it had to be adjusted and how it played (Photo C). By the end of the first day, my logbook included a CW contact with New Zealand, a PSK-31 contact with a Route 66 Memorial station in Santa Monica and a couple of W1AW/5 contacts. Seems like it works!

If you are interested in learning more about Buddipole, I highly recommend the book by Scott Andersen, NE1RD, Buddipole in the Field. It’s available for free download in the Files section of the Buddipole Yahoo group. Besides spelling out in great detail how to set up the various antennas, he spends plenty of pages on the antenna theory involved. Quite a good brushup course. The Buddipole Yahoo group is also a great source of information and practical experience.

As Mike was assembling the parts that made up the Deluxe Buddistick I was taking home, Chris pointed out that they include an extra collapsible whip with the Deluxe model because that’s the item people seem to break first. Apparently, first-time users are so involved in getting their antenna up and tuned that they ignore the need to guy it or attach it firmly to its support, and the first hard gust of wind knocks it over. The collapsible whip that comes with the Buddi products is certainly the most robust one of its kind that I’ve ever seen, but when the antenna goes down, the force at the end of the whip is pretty strong. So I took these words to heart when assembling my Buddistick and actually had it for a month before I let it fall. Twice. In the same day. So I managed to bust both my whips. I’ve just ordered the shock-corded whip for a replacement. Maybe it will stand up better to the fumbling of this dufus.

The Buddistick comes in a zippered nylon case, which measures about 9 X 15 inches, small enough to fit easily in a backpack. Mine came home from the Oregon trip in my backpack as carry-on luggage and didn’t trip any alarms going through security. There are some hard knobs in the foothills near home which are ripe for hiking radio adventures. The Buddistick is something that my aging legs will be able to carry to the top. Hope to hear you on the air!

Fine Tuning the EARCHI End Fed Antenna

No doubt that portable operating is one of the most popular of QRP pastimes these days. Besides casual operations from a picnic table or from a trailside spot with a great view, there are plenty of SOTA activators, people operating from a vacation location or just somewhere where they can escape local CC&Rs. An ideal portable antenna has many requirements. It has to be small, lightweight, pack-able, effective, and easy to tune up and use.

The end-fed half-wave antenna (EFHW) has grown in popularity recently and become the favorite of many. It meets the criteria for weight and size and, assuming that the operator has a way of launching or hanging it, it goes up easily, quickly, and can be in operation in just a few minutes. It’s also pretty effective. In several comparison tests between a vertical EFHW and a dipole, the nod usually goes to the horizontal antenna but only when it can be erected high enough to make it radiate at a decent angle. A half-wave vertical can match or better a low dipole much of the time.

But an EFHW is a monoband antenna or at best, a duobander, if your bands of interest are harmonically related, such as 10 and 20 meters. There are some multiband endfeds that use traps to include another band or so, but still, your choice of bands is limited.

Photo D. The homebrewed EARCHI 9:1 UNUN with choke attached. There’s enough room in this box so the choke can move inside, permanently.

Hence the growing popularity of the End-Fed Matchbox being sold by the Emergency Amateur Radio Club of Hawaii (EARCHI for short.) The club sells ready-made antennas and, for those who want to roll their own, the club publishes detailed building instructions on its website, <http://www.earchi.org/proj_homebrew.html>. The concept is quite simple. The antenna is a piece of wire that is connected to a 9:1 UNUN. That’s it. According to the literature on the website, “The problem with an EFHW is that the antenna presents
high impedance, creating a significant mismatch with the usual transceiver impedance of 50 ohms. This mismatch is significantly greater than typical tuners can accommodate without a matching transformer. This project creates a trifilar wound, 9:1 UNUN (unbalanced to unbalanced) toroid matching transformer that will match the high-input impedance of an end-fed antenna into the range where most antenna tuners can produce good performance."

The concept is simple. Transform the high impedance of the end-fed antenna into something more manageable, send it via coax to your tuner, and let the tuner do the rest of the work. To give the concept a try, I dug into the parts bin here and came up with all of the requisite parts including a small project box. The result is shown in Photo D. Attached to the output of the box is a choke UNUN (more on this item later).

If you purchase a ready-made EARCHI antenna you'll receive a 30-foot piece of wire for the radiating element. I had a piece of wire that was a half-wave on 20 meters, or closer to 33 feet, so I launched it and attached the matchbox. The EARCHI instructions also recommend starting with a 16-foot piece of coax to the transceiver, mostly because the antenna needs a counterpoise, the outside of the coax provides that service and 16 feet is a good compromise length. I found a 15-foot length of RG58, hooked it up to my KK3 and powered it up. The internal tuner in the transceiver easily matched the impedance presented to it on all bands, 20 through 10 meters. The next step was to prove that I hadn't just created a well-tuned dummy load. Received signals were strong on all bands and I was able to make Qs pretty easily on all bands.

However ... if we back up a couple paragraphs to the verbiage in the build instructions, you will notice that in the first sentence the author referred to "end-fed, half-wave antenna" and then later mentioned "the high-input impedance of an end fed antenna..." Notice that the words "half wave" were dropped in the second sentence. This is an important point. We need to make the distinction between the two. An EFHW is exactly that, a half-wave long piece of wire fed at the end. An end-fed antenna isn't necessarily a half-wave long, so it has different qualities. An interesting feature of the EFHW is that the feed point comes at a high impedance point, where there's a very high voltage and very low current. The low current flow at this point means that there's really little or no need for a counterpoise. For a good reference on EFHWs, navigate to Steve Yates, AA5TB's, website at <http://www.aa5tb.com/efha.html>. Steve concludes that the optimal length for a counterpoise for this antenna is 0.05 wavelength, or roughly 3 feet at 20 meters. In actuality, I've tried using an EFHW both with a 3-foot counterpoise and without one and have found little difference. The important point is that there's really very little current flowing in the counterpoise, and it's of negligible significance. The same is true for 10 meters, where the 33-foot wire is a full wavelength long and feeding it at the end is the same as feeding it at the end of a half wave.

The bands in between, 17, 15, and 12 meters, represent a different kind of load. Imagine an off-center fed antenna with your rig connected to one end. There would probably be plenty of RF present at this point. The EARCHI documentation suggests that the antenna needs a counterpoise and that the
outside of the coax serves this purpose. As noted above, it also suggests using a 16-foot piece of coax as this length would serve as a good compromise length. The problem with this setup is there is nothing magical at the end of this piece of coax to prevent the RF from continuing to flow into your radio, around your radio, up your arm, out your ears, etc. You get the idea.

To get an idea of how much RF is present at the end of the feed line, I used the quasi-scientific method I refer to as the Hand Capacitance Variance Test. This involves using a tuner to bring the SWR to 1:1 at the frequency of interest, then placing a hand on either side of the antenna analyzer and noting the change in SWR (see Photos E and F). The left-hand photo (Photo E) shows the antenna tuned to resonance and the right-hand photo (Photo F) shows the SWR with one hand on the antenna analyzer. In this case, I needed my other hand to hold the camera, but with two hands on the analyzer, the SWR jumps even higher. Is it significant that there’s a bunch of RF floating around your rig? If everything works well, the keyer doesn’t start sending gibberish and the antenna tuner is able to match the load, then operating at ORP levels is probably not a big deal. I tried making some SSB contacts and one guy came back to me and said that my signal was plenty loud but he couldn’t make out anything I was saying because there appeared to be RF getting into the rig. No kidding.

In addition, most folks who will feed this matchbox with 16 feet of coax will have the coax lying on the ground, and this is not a good thing. There’s plenty of current on the coax shield and when you lay that on the ground, you end up warming the earthworms instead of the ether. Would you ever set up a dipole with one half of it lying on the ground? I think not. The same thing applies here. One way of treating this situation would be to elevate your coax and put a choke between the coax and the rig. A better way would be to cut a piece of wire to 16 feet and attach it to the matchbox as a counterpoise, keeping it raised several feet off the ground. Then place a choke between the matchbox and the coax. This way you get your counterpoise raised off the ground where it can do some good and the coax is taken out of the equation so you can lay it on the ground to your heart’s content. And the length of the coax is no longer critical. Make it as long or short as you want, but I’d suggest making it as short as possible because it has a pretty foul SWR on it and the increased loss due to SWR will eat up a chunk of your power.

In an effort to determine if the power lost by laying your coax on the ground is significant, I turned to the Reverse Beacon Network. Over several trials, the results were fairly consistent. Here’s an example: On 15 meters I sent a CQ with the coax connected directly to the matchbox, then changed frequency about 15 kHz and transmitted another CQ with the addition of the counterpoise wire and the choke. The first CQ netted two spots. The second CQ received spots from the same two stations at 5 and 6 dB stronger reports, plus an additional four spots. So six spots versus two, and with stronger signal reports. The two CQs were sent about a minute apart so propagation didn’t change drastically between the two tests.

In the end, what we have is a pretty simple end-fed antenna which is easy to carry, easy to erect, and provides for practically instantaneous band changing. Adding the counterpoise and choke will make it even better performer.

Sign Off
This issue most likely finds you in the grip of a deep winter freeze. Good times for quiet winter bands and plenty of QRP DX! New Year’s resolutions? Cleaning up the shack and tidying the rat’s nest behind the operating table top the list as they do every year.

7273, Cam N6GA

Notes:
1. EFHWA: End-Fed Half-Wave Antenna
2. SOTA: Summits On The Air
3. CC&Rs: Conditions, Covenants and Restrictions — a document that is part of most deeds for condos or houses in homeowner association (HOA)-controlled communities. Many, if not most, restrict or prohibit outdoor antennas.

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