**Contesting 101**
By Kirk Pickering, K4RO

**Basic Antennas for Contesting**
I was chatting with fellow contester and WRTC competitor W4PA recently, and I asked him if he had any good ideas for the Contesting 101 column. Scott felt that developing a basic knowledge about antenna designs and beaming target areas was a major turning point in his contesting career. He recalled the time he set up phased verticals for 80 meters for Europe, and realized just how important a role antennas can play in contesting success. My own “aha moment” came after I installed my first Beverage receiving antenna. I simply could not believe that a whole new layer of stations to work was available, simply for the cost of a few hundred feet of wire and some grunt time in the woods with a compass. There are hundreds of books and thousands of articles written about antenna design and construction, and I recommend that you try to learn as much as you can. Be sure to read W9XT's last two columns in NCJ about antennas for contesting. What I will attempt to do in this article is explain some basic fundamentals about antenna selection and design specifically for contest operating,

**Contests are Different**
The antenna needs of the contest operator are different than that of the casual rag-chewer or even the serious DX chaser. Because contesting is a race against the clock, we need to be able to adapt to varying conditions and situations very quickly. While the DX'er is usually only working one specific station in one specific direction, the contest operator may have multiple simultaneous callers from many different directions. While the rag-chewer has plenty of time to crank the roller inductor on his tuner for maximum output on a single frequency, the contester is constantly changing frequencies and even bands, and does not have the luxury of time to spend tuning anything.

Contesters need to have an above-average signal into the major population centers when bands are open, yet still be flexible enough to be able to pick up the rare double multiplier on the difficult paths and bands. Some big contest stations may appear to have “too many antennas,” but chances are that there is a specific reason for each one. The old adage that “you can't have too many antennas” is probably true, with two caveats: 1) antennas can interact with each and actually *degrade* each others' performance if not carefully engineered and located, and 2) one must be able to *effectively* use all of the available antennas. An array of sixteen A/B switches might be pretty confusing to decipher on the second night of a DX contest, especially for guest operators.

**Target Areas**
A good place to begin is to understand the concept of target areas in contesting. While actual target area directions vary considerably depending on your geographic location, the concept is the same. The contester needs to focus first on the primary target areas for the contest in mind. For DX contests, this usually means EU (or NA if you are in EU.) For North American contest, this usually means the USA east coast, and California. In order to rack up a good QSO number, it is essential to understand where the target areas are located, and to have a good signal into them.

From the east coast of North America for example, DX contests rule, and Europe dominates the QSO count. That means that folks who want to do well in DX contests should start their efforts by getting a big signal into Europe, on as many bands as possible. For folks on the

west coast of North America, Japan provides the majority of QSOs in a DX contest (although this trend is downward.) Therefore DX contesters on the west coast would be wise to construct effective antennas for JA. For folks in the middle of the country, both directions are equally important.

Domestic contests tend to favor the west coast, especially when the high bands are open. Their primary target area is the east coast, so it makes sense to cover the east direction first. In southern North America, it is important to have effective antennas for both the east coast and west coast. The point is that you want antennas that are effective into the areas where the operators are. For example, if you live in Tennessee and the only antenna that you can install is a dipole for 40 meters, orient it NW/SE to maximize your signal into the NE quadrant. (Remember that a dipole radiates strongest perpendicular to the wire.) There are simply more stations to be worked towards the NE than the NW, from TN, so it makes more sense to cover that area first. Since a dipole radiates in two directions in a figure-eight pattern, you will also have a good signal to the SW.

No single antenna is going to work effectively in all directions, and often two or more directions are needed simultaneously. For starters, a good approach is to choose your two most important directions, and start by building antennas optimized for those directions. Even simple antennas have directions where they are strong (lobes) and directions where they are weak (nulls.) When you know where the nulls and lobes are located, you can take advantage of this fact by using one antenna that is oriented specifically to place its lobes where the other antenna has nulls.

**Some Examples**

We mentioned the dipole above, and how it radiates in two directions broadside to the wire. Keeping it simple, a great idea would be to add one more dipole, and orient it perpendicular to the first one. That would give us the advantage of having two sets of directions to choose from. The null off of the end of a dipole can greatly attenuate signals, resulting in differences of 20-30dB from another oriented perpendicular to it. That's like having a very large amplifier turned on when switching directions, and even more importantly, it works on both transmit *and* receive. Add a vertical antenna for the lower angle signals, and you can enjoy considerable diversity in both azimuth and elevation, from three simple antennas.

Be sure to include some kind of antenna switch,so that you can quickly select the best antenna for the current QSO. Note that none of the antennas mentioned have any real *gain* over a theoretical reference antenna, but they have considerable gain *over each other* in different directions. Such a combination of simple antennas allows greater coverage in more directions than any single antenna possibly could.

**Getting Some Gain**

One amazing thing about antennas is that you can modify their performance by placing other antenna elements in close proximity. Using a vertical antenna as an example, the typical shape of the antenna's response (looking down from the sky, at the azimuth pattern) is a circle. By simply placing another vertical element a specific distance away, we can “squeeze” that circle into another shape, like a cardioid (heart-shaped) pattern. It's like squeezing a balloon – we take energy away from one direction, and squeeze the pattern into a new direction of our choosing. We can orient the antenna in such a way that most of our energy is being radiated in the desired direction (towards the population centers.) Not only are we

louder in the desired direction, but we can hear much better as well. Signals from all other directions are attenuated, while the desired direction has some gain.

Here is another example. After using nothing but wire dipoles and single vertical antennas for 40 meters, I was wanting something better into Europe. I had loaded the boom of my tri-bander with an omega match (N4KG design – see http://www.k4ro.net/k4ro/station_tour/40boom.html)

The rotatable boom dipole was great for a lot of multipliers, and it was my best 40 meter antenna to date. Unfortunately I was still feeling weak into Europe. Most notably, anyone locally with a “shorty-forty” yagi was cleaning my clock on 40M in DX contests. Plus, the QRM from everything west of me was deafening when trying to hear Europe. After a few different experiments with different designs, I put up a two-element wire beam fixed on Europe for 40 meters at about 70 feet. Once I got the ropes in the trees and the geometry correct, I had an antenna that really made a difference. For the first time, I could actually run European stations on 40 meters (even if somewhat high in the band.) I was no longer always the last guy through in the pileups. While I'd rather have a real rotatable 40M beam (someday hopefully) the second wire element added to a simple dipole really made a believer out of me. I still use the rotatable boom dipole for directions other than EU, so I kept it as well. A simple two element wire beam is not that hard to construct, especially for the higher bands. You can find simple designs in publications such as the ARRL Antenna Book and ARRL Handbook.

That's all for this installment. Next time, we'll try to cover a little bit about basic propagation, and how we can learn to “follow the sun” to maximize our usage of each band opening. See you on the bands, and don't forget to submit your log to the sponsor, no matter how many QSOs you made. Your log submission improves the potential log checking potential accuracy, and will also allow you to receive a log checking report. Please send any questions or comments to me at k4ro@k4ro.net. **73**