March 1998 Pileup

Presidential Ponderings

Greetings to all our old and new friends reading this special edition of The PILEUP! Whether you are reading from a computer screen or a printed version, CDXA welcomes you to Charlotte and the Hamfest! Here's hoping you find all the things you came to buy, sold all the stuff you came to sell, saw all the friends you thought you might see, plus some others as well, and generally had a great time.

The Carolina DX Association is made up of hams who love to chase DX. Some of us contest, from 160M through UHF. Most of us also love to work on antennas, or towers (as our bodies allow), and other fun hardware stuff. Most of us are incorporating computers into our hobby at a rapid pace.

CDXA operates a repeater on 147.18 MHz (+600 offset), sponsors a PacketCluster DX spotting network, and includes some distinguished members of national stature. We're indeed blessed to have beginners and experienced members blended in our club, so we all benefit from youthful vigor and mature direction.

Interested in our club? Any of our officers will be glad to give you an application at our booth. Other contact information is included in this publication. Thanks to all our members who worked so hard to bring you an interesting booth this year. Again, I hope the Charlotte Hamfest is one of the best for you! See you in the pileups.

73 Joe K4MD

Back to the Top

Editorial

It's March, as in the Ides of, as in Charlotte, as in our annual Hamfest, as in the usual collection of fun and good times, but wait a minute (FADE IN: electric guitar riff), whoever thought of having a hamfest on a DX contest weekend? Probably NOT a committee of hf-operating hams, right?

But, I digress, this is what we have to work with, so…let us go then, you and I, when the evening is spread out against the sky…uh-oh, that English degree creeps in, insidious as sin, as secret as the sex life of a President, as simple and serious as "5-9, North Carolina," or "You want how much for that FT-1000…?" The remainder of this editorial contains nothing about Monica, Farrah, or Pamela Lee… nor Wells, or Welles, as in H. G. and Orson-giants of fictive and creative world-making. Who managed, with 40 years separation, to scare folks silly with their imaginary zeal.

We can, however, consider Dayton, another Hamfest, albeit a bit further North, yet even more interesting, even more fun-filled and good. Are YOU going? You should. You need to go. You really do. We can, however, consider some of that Wellesian fervor the next time you encounter someone from the club asking for help. Or seeking a favor. Looking for a solution to a problem. That zeal and enthusiasm is what hamming's all about. You know that, of course. It's why you got into the hobby in the first place, right? Because it just seemed like so much fun, so neat, so full of promise and adventure. So cutting edge. So clever. When's the last time you had some of that fun, some of that cleverness?

We can usually recapture that zeal and enthusiasm and fervor when we help others (especially beginners or newcomers). It's that old song once again (REPLAY: guitar riff): You get as much out of something as you put in. And what the newcomer puts in (enthusiastic responses to almost everything) grows (at least we hope it does) into something like success.

We can usually recapture some of what pulled us into hamming if we merely remember our own past. It's called history, and we all have some. It's partly those stories which begin: "Back in the old days….," because no matter how little or long we've been hams, we each have a history, a past, a beginning. For some of us, it's remembering crystal-controlled 75 watt Novice rigs and BC-348 receivers and long wires (yet we actually worked folks!) and for others, it was starting out with a bright, shiny, fresh-out-of-the-box Kenwood rig. Remember when….?

Why else is something like Titanic (that current hit film-about a ship which sank way back in 1912) so popular? Memory, along with a story which promotes fantasy and projection into a past most viewers cannot possibly remember, combined with dazzling special effects, makes for strong moments of resonance among the audience. Ham radio could use something so imaginative, so simple and serious. Something which could cross any boundaries of license class, experience, and interests. Something which could galvanize each and every one of us into being better hams. Better operators. Real zealots, rife with energy and eager to take part in our hobby.

K4ZA

Back to the Top

Packetcluster News

Over the years, there have always been times when users got disconnected. This will continue to be a problem occasionally. -For instance, it's a rare user who knows his deviation (with certainty), or if there is any clipping or distortion on his signal. We all take our synthesized rig's frequency readout as gospel, but I assure you, they CAN be off frequency, while continuing to display the correct frequency. If you're off a bit in one direction, and the station you try to connect to is off a bit in the other direction, it can be enough to cause either full or intermittent problems.

There were intermittent problems on N4ZC's 144.93 MHz user frequency. The 441.00 MHz user frequency and the two backbone frequencies, were never a problem. When the intermittent problem occurred, no user could connect to N4ZC on 144.93 MHz. We changed the 144.93 TNC, transceiver, as well as the antenna. A backup copy of the node software was reloaded. We watched the SWR to see if it changed, or if the power output changed between working/not working periods. We listened to the audio and watched the S-meter for hours-to see if other signals were causing the problem. All to no avail. In a nutshell, these problems were creating real anxiety for N4ZC. In the interest of his health, Roger has turned off everything.

The TNC at DXBMR was showing "busy" to anyone trying to connect. Here are the solutions we tried: 1) another MFJ-1270B placement TNC, which didn't work; 2) K4MD hooked up and checked out a new KPC-9612 and TM-261 package for DXBMR, which N4ZC took to Statesville, while NA4L drove down from Hillsville, VA to pick up. This new equipment took care of the "busy" problem, but there is still an intermittent problem for connections to N4ZC through DXBMR. Others who have monitored the frequency note there are times when DXBMR doesn't seem to hear N4ZC. The most likely cause of this is desensing or intermod directly at the Beamer Knob site. As soon as a cavity can be tuned to the frequency, and placed in service, we'll see if that solves this problem. NA4L and WD4BTF replaced the G-6 with a new G-6-270 dualband 144/440 MHz antenna. As soon as the club gets one of its Motorola 440 MHz radios converted, it will be placed in service at DXBMR to give a full scale 9600 baud backbone signal to the node via DXUYNG.

K0SD is the only person with a key who can work on DXYNG problems. Stephen has had some serious family problems and has been unable to work on DXYNG. And three prior trips up the mountain have not isolated the trouble. There are continuing problems with the 146.73 MHz repeater on the mountain. Its antenna is about the same height as ours, and only about 50-feet away. We don't bother them; they bother us. Gary, N5BI has gotten us permission to move to another tower, about 500-feet away from the present site. This site has a 600-foot tower, which starts about 50-feet lower down the hill. Since it's been such a problem for K0SD to go up to the site, K4MD talked to the Dial-Page office in Charlotte, and asked if there was a time when one of their people could meet us to take down our equipment. They had a technician going to the site later that day. Since the equipment had to be checked out for the new site, we had to take it down-that day. We needed to be able to match the Kenwood TM-261 transceiver to the new KPC-9612 TNC to guarantee correct deviation. We also needed the antenna to be ready to mount on the new tower, as soon as we have a key for this new site. We have permission to use a hardline going to the 500-foot level on this tower. This will put us over 400-feet higher than our old antenna. The antenna at 500-feet is just for 440 MHz. We will need to mount our old antenna on the new tower for 144.95 MHz. Hopefully, this 500-foot horizontal separation will clear up the repeater problem. Paul, KR4IN, who lives a few miles from the DXYNG site, has kindly offered to maintain the site for us. (This is a wonderful offer from Paul!) With our own CDXA key, and KR4IN's help, we should be able to do a much better job of fixing future DXYNG problems. Our plans are to run both 1200 and 9600 baud on the DXUYNG equipment, making it easier for users to connect with old or new TNCs. We want to do it this way, but you can never be sure something will work-before trying it. If it's too much of a problem, the final setup will be just 9600 baud on 441.0 MHz. The higher antenna and higher power of the new 441.0 MHz transceiver should provide a much better coverage area for 440 users.

Work proceeds at K4ZA's place on installing the 144.93 MHz equipment. Heliax connectors should be delivered this weekend at the Hamfest. It's a simple matter of Don finding some time in his busy work schedule (lately, he's been traveling a lot) to complete this installation New gear, using W4DXA, is temporarily operating at N4ZC's QTH until Don gets the antennas ready at his location.

K4ZA & N4ZC

Back to the Top

One of the more prolific authors on antenna modeling is L.B. Cebik, W4RNL, who has graciously allowed *The Pileup* reprint rights to an article that can be found on his homepage (originally appearing in a Colorado club bulletin as "ANTENNAS FROM THE GROUND UP"), it represents a good, basic introduction to modeling.

--K4ZA

For those interested in this topic, we refer you to the AntenneX homepage (http://www.antennex.com) where W4RNL writes a column, as well as his own homepage (http://funnelweb.utcc.utk.edu/~cebik/radio.html)

L. B. Cebik, W4RNL

One of the goals of this series is to help you answer your own antenna questions. There are many tools available to help you do this. For new antennas you construct, there are antenna analyzers, SWR meters, and the like. For theory and construction ideas, there are books galore (not to mention articles like these). Finally, but very importantly, there is antenna modeling software.

First, you have to like your computer. Second, although there are some basic modeling cores for MAC, modeling is a PC business, especially if you want to use one of the commercial versions. Third, you have to learn how to ask the modeling program good questions and read its answer intelligently. Although I cannot make you like your computer, I can tell you where to find software and how to get started in using it wisely.

Even if you do not intend to buy or download a modeling program, you should continue reading. When you are done, you will at least have a better grasp of what all those antenna plots and graphs in the magazine articles are trying to tell you.

What's Available and Where

There are many types of antenna modeling programs. Modeling an antenna is simply calculating some of the antenna properties. There are BASIC programs in HAMCALC for designing a number of different antennas. (Some are more accurate than others.) There are special purpose programs, like YAGIMAX, that can help you optimize certain kinds of antennas.

However, when most folks speak of antenna modeling these days, they are referring to the Numerical Electromagnetics Code, either in its FORTRAN version (NEC) or its offshoot BASIC version (MININEC). These programs are very powerful "method of moments" calculation machines that, within limits, can produce a lot of accurate information about antennas.

Both NEC-2 and MININEC are public domain programs, so you can download them for free. However, you have to design your own user interface to get information about your antenna in and get calculation results out. Like this:

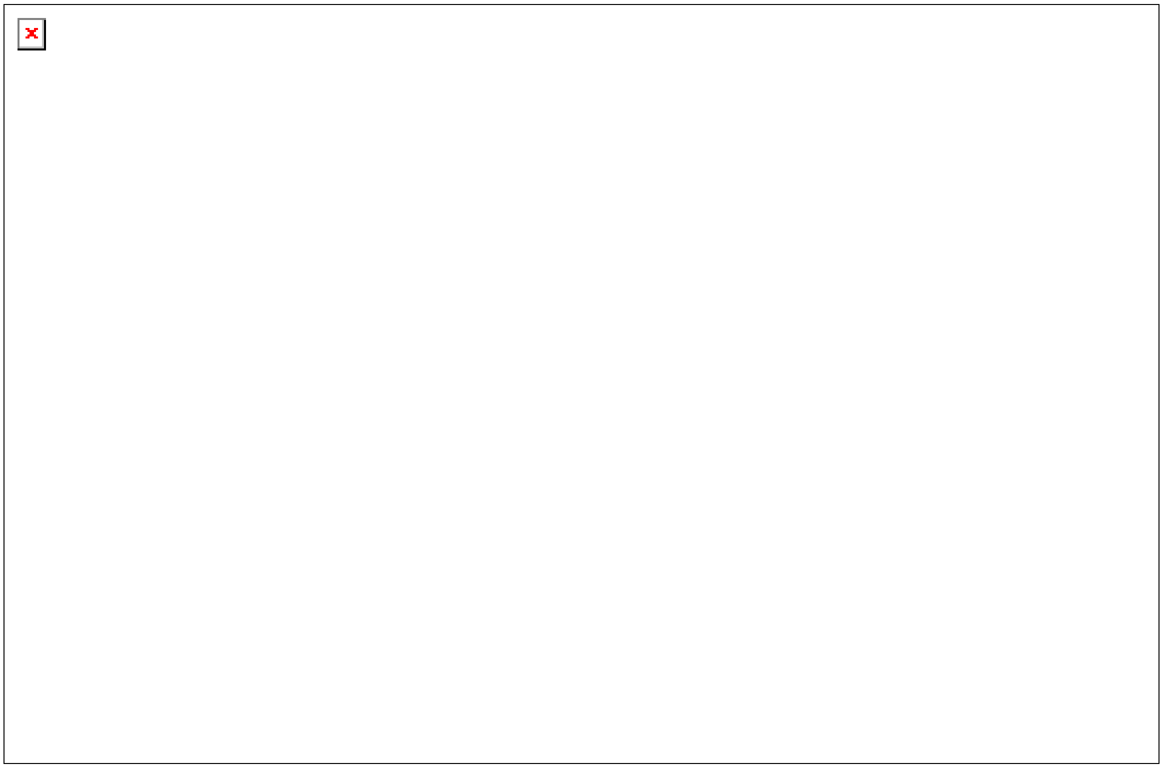

Figure 1: An SWR curve of a model.

Figure 1 told me that I cut the 40-meter dipole model too long, so I pruned a number rather than a piece of wire.

Both NEC and MININEC have limitations. NEC-2 cannot handle wires of dissimilar diameters well, but it can deal with antennas close to ground. MININEC is limited to antennas above 0.2 wavelengths above ground and requires special techniques to handle wires that meet at angles. Both have their place, but for wire antennas in the 160-30 meter region, I recommend NEC.

There are three commercial versions of NEC-2 available to hams for under $90. These are:

EZNEC, by Roy Lewallen, W7EL, P.O. Box 6658, Beaverton, OR 97007. This DOS program ($89) has a "friendly" user interface by most reports and a 500-segment limit for antenna size.

NEC/Wires by Brian Beezley, K6STI, 3532 Kinda Vista, San Marcos, CA 92069. This DOS program ($70) uses a different input interface that allows formulas, also with a similar segment limit.

NEC-Win Basic by Paragon Technologies, 3006 Research Drive, State College, PA 16803. This is the only Windows version of NEC ($75) and uses a spreadsheet style input system.

Both EZNEC and NEC-Win have "big brothers" for virtually unlimited antenna sizes, and NEC-Win

Pro has added graphics capabilities. However, prices are considerably higher.

All three programs have been designed or tested by hams. I use versions of all three from time to time, along with the MININEC versions of each (ELNEC from W7EL and AO from K6STI, along with NEC4WIN from Orion in Canada and MININEC for Windows from MININEC creators Rockway and Logan).

What Can I Learn From Models?

Lots! Many purchasers simply try to model the antenna(s) they have and then never use them again. Bad approach. Making good models takes a good bit of experience in playing with the program, and the programs can teach you a lot about different types of antennas in different circumstances.

First, you create a physical model of the antenna of interest, laying out wires on an X, Y, Z coordinate system, and specifying wire size and material, ground conditions, and other information needed for the analysis. Then the program provides you with (as a start) complete far field information (available graphically or in tables), feedpoint impedance and related data, antenna current levels, and more.

The numerical data, such as feedpoint impedance and SWR relative to 50 ohms, is easy to interpret. Antenna patterns require a little more effort.

Let's start in free space, that spherical volume in "outer space" free of all conductive obstructions. Let's place a dipole there and look at its 3-D pattern. It looks like Figure 2, where the wire-line is a highly magnified orienting guide to the antenna position. Since this is a "far-field" pattern, the actual antenna would be too miniscule to see.

Fig. 2

An azimuth pattern is one tracing a horizontal circle around the antenna pattern. We take azimuth patterns at some specified elevation angle. For free space, the angle is typically (but not absolutely always) 0° elevation. Mentally cutting Figure 2 on the flat, which is almost from the bottom left corner to the top right corner, we get the following azimuth pattern:

Fig. 3. Free space azimuth pattern of a dipole.

You will recognize the side nulls as corresponding to the side-pucker of the 3-D view. In free space, for a dipole, every slice through the donut would present the same view of the antenna pattern.

The elevation view of the pattern is a slice vertically through the 3-D pattern. It can be at any specified azimuth angle, but typically we choose the azimuth angle of strongest radiation. Here the angle is either 90° or 270°.

What determines the 90-270° orientation in part results from how the model was constructed. For a horizontal dipole, you can put the length of the antenna in the X dimension--which gives the pattern in Figure 3--or in the Y dimension--which would change the antenna orientation by 90 degrees. A Y-dimensioned dipole would show maximum radiation in azimuth directions 0° and 180°. (My preference for speed of making alterations is to put the longest or most changeable length in the X dimension. Hence, all broadside patterns will be oriented as in Figure 3.)

The vertical slice through the donut, of course, would yield a simple circle indicating equal power at all elevation angles. All NEC models presume the principle of reciprocity; that is, the pattern of power radiation equals the pattern of receiving sensitivity.

Antennas mounted over the ground are more complex, because the portion of the free space pattern representing downward radiation is reflected by the ground back upward in accord with basic optical principles, adjusted by the program for ground losses. The actual amount of ground loss for horizontal antennas does not differ greatly from great soil to very poor soil, so for most purposes, models are taken over average ground. The values of conductivity and the dielectric constant are usually built into the program as defaults.

Let's put a 40-meter dipole up 70' and look at its 3-D pattern:

Fig. 4

The exaggerated line represents the antenna wire. Here it passes at the base of the pattern through the bottom-most side puckers. Maximum radiation is broadside to the wire, but at upward angles.

The next step is to take an elevation pattern, a vertical slice through the direction of maximum radiation (from lower left to upper right). For this antenna, the angle will again be either 90° or 270° on the azimuth circle.

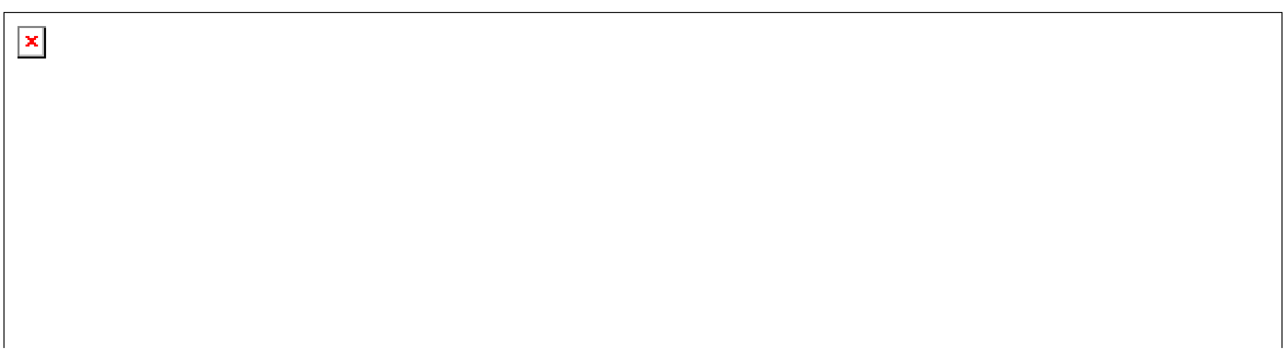

Fig.5. Elevation pattern of a 40-meter dipole at 70' height along the azimuth of maximum radiation.

You can likely recognize the center "hump" from the 3-D plot and the upturned ends. Note that there is no radiation at 0° elevation angle because far-field plots are assumed to be so far distant that point-to- point and ground wave radiation are no longer factors that determine the pattern.

Creating an azimuth pattern involves choosing an elevation angle above 0°. We may use any number of bases for our selection, but two are most common. One is the angle of maximum radiation to see just what the maximum gain of the antenna may be and how the pattern at that angle looks. The model told me that the angle of maximum radiation (also called the "take-off" angle) is 27°.

Figure 6 displays the azimuth pattern of the dipole at its take-off angle. Remember that the pattern is actually a sort of cone, with the center of the pattern circle at the antenna height. The cone slopes upward all around the circle at an angle of 27° above the horizon. You can also see from Figure 6 that the maximum gain is 7.6 dBi.

Fig. 6. Azimuth pattern of a 40-meter dipole at 70' height at an elevation angle of 27°, the angle of

maximum radiation.

A second route to creating an azimuth pattern is to begin with an independent interest in some skip path angle. Suppose, for instance, that you have good reason to believe that the best path to Europe requires a skip angle of 17°. What would the antennaþs pattern look like at that angle?

Fig. 7. Azimuth pattern of a 40-meter dipole at 70' height at an elevation angle of 17°, the angle of special interest.

From Figure 7, it is clear that the shape of the pattern has not significantly changed relative to the pattern shape at the 27° elevation angle. However, the gain is down considerably. Looking at the 3-D pattern and the elevation pattern, we can see that this new cone slice is taken at an angle of lesser radiation.

From Figure 7, it is clear that the shape of the pattern has not significantly changed relative to the pattern shape at the 27° elevation angle. However, the gain is down considerably. Looking at the 3-D pattern and the elevation pattern, we can see that this new cone slice is taken at an angle of lesser radiation.

Is That All There Is?

Individual patterns are very instructive, but they only provide spot data. There are numerous ways to increase the amount of information from models of antennas.

One way to increase the amount of information in a pattern is to combine several elevation or several azimuth patterns into one graph. For example, if we had combined Figures 6 and 7, the lesser strength of the radiation at the lower angle would have been evident.

We can also combine elevation patterns. For example, place a dipole, a 2- element Yagi, and a 3-element Yagi at the same height and combine their elevation patterns in the azimuth of greatest radiation. You will see the evolution of the bidirectional dipole into a pattern with high forward gain and a high front-to-back ratio.

Fig.8. 10-meter dipole, 2-element Yagi, and 3-element Yagi elevation patterns

A second way to derive more antenna information from a modeling program is to frequency-sweep an antenna. Specify upper and lower frequency limits and the increments for spot checks between these limits. You can produce data on pattern changes, such as where the gain reaches maximum and where the front-to-back ratio (if relevant) reaches maximum. You can also watch the feedpoint impedance, both resistance and reactance, change across the sweep range. Some antenna designs are quite narrow, and one or more of their properties may change drastically even within a ham band. Others are broad and do not radically change any characteristics over wide frequency ranges.

Another instructive exercise is to watch the properties of an antenna change with height as you step the model height at regular intervals. Although most programs have frequency sweep capabilities, you will have to increase the model height manually. However, you may discover interesting changes of patterns or the feedpoint impedance along the way.

There are innumerable systematic questions you can pose to a modeling program, and the answers you glean can teach you much about antennas. Unfortunately, most antenna modeling program users make a few spot checks of their own antennas and then never open the program again. These folks lose fully 90% of the benefits of the program.

I have dwelled on the basics of antenna modeling because much in this series will be derived from them or illustrated by them. In fact, you can make a whole handbook of expectations from them.

Back to the Top

The Back Page

Here in "the free world," we often forget that colonialism is still alive and well. For instance, Britain still has 13 territories left, after the return of Hong Kong to China last June. These are to be renamed, in order to make them sound more modern, as part of a Foreign Office review of policy. Currently called "dependent territories," the new name "British overseas territories" will take effect next month. "Colony," implying subservience, was discontinued in 1956. Citizenship, which is also common to the 11 territories under review, is part of the review process as well. Gibraltar and the Falklands-disputed territories with Spain and Argentina-are not under review. Here are the territories and their populations:

Anguilla	10,000
Bermuda	61,000
British Antarctic Territory	uninhabited
British Indian Ocean Territory	uninhabited
British Virgin Islands	19,3000
Cayman Islands	33,6000
Falkland Islands	2,500
Gibraltar	31,000
Montserrat	12,000
Pitcairn, Oeno Islands	58
St. Helena	6,000
South Georgia, South Sandwich Islands	uninhabited
Turks and Caicos Islands	13,000

--N4UH

Back to the Top