JUG

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NCCC

#606 – January 2003

NCCC – 52 years of contesting excellence

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NCCC ZOOM MEETINGS
https://nccc.cc/meetings.html

Next Meeting

Tuesday 17 January
Open Chat 6 PM
Meeting: 6:30 PM – 8:30 PM

"Node Red"

Andreas Junge N6NU

President's Report

David Jaffe - WD6T

It can be hard to evaluate how well you are doing as a contester. Your success rate depends on so many things beyond your control: band conditions, participation, weather (both solar and terrestrial), and visits from Dr. Murphy. How can you have any idea if you are actually improving? And what effect, if any, does practice have?

Everyone who plays an instrument knows that practice can lead to improvement. But does it always? There are many ways to practice and some are more productive than others. Inexperienced musicians tend to simply play their piece from the beginning to the end over and over, stumbling when they get to the hard parts. This just trains you to make mistakes. A better method is to isolate the difficult passages and focus on them. A still more effective approach is to analyze what makes a passage hard and dissect it into its individual technical challenges, isolating each and devising an etude that trains that weakness.

There is also another important category of "practice" for a musician: getting out in front of people. There you confront stage fright, attention deficit, and other features of (as my Russian violin teacher used to say) "exposing yourself in public." One of the most important lessons a musician learns is that "the show must go on." If you make a mistake (and you will), then if you start thinking about the fact that you made a mistake, you will make more mistakes, because you are no longer focused on the

music. It has often been said that a performer should think of the audience in their underwear, as cabbages, or some other silly imagery. But that's bad advice, because it takes you away from the music; you need to be in the music.

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How does all this relate to contest operating?

Suppose you want to improve your CW speed and accuracy. There are a number of great tools such as MorseRunner and Rufz. One of my favorites is LCWO.net. Just as the musician is able to isolate difficult technical passages, it allows the CW operator to design exercises to train his weaknesses. For example, many of us have issues counting dots at high speeds, and tend to mix up "B" and "D", "S" and "H", "U" and "V", etc. LCWO lets you design a practice session with just those letters and gradually increase the speed.

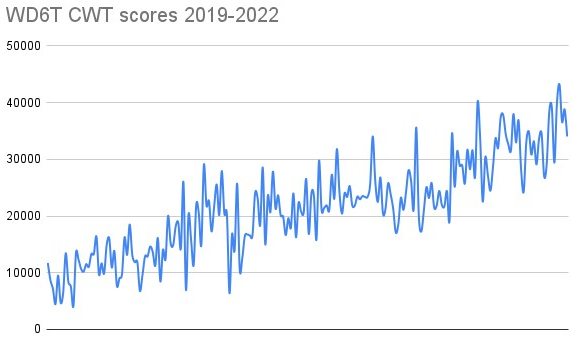
It has been said (by researchers, as well as Mary Poppins!) that if you can make something into a game, you are more likely to continue with it. This “gameification” can make anything more fun, even rote practicing. LCWO.net allows you to create an online account and keep track of your results and compare them to others. There are various categories, including code groups, plain text training, word training, call sign training and QTC training. Give it a try!

What of the second type of practice: "pushing yourself on stage"? There’s nothing like real contesting to get the juices flowing. Perhaps you’ve only done search-and-pounce; you can challenge yourself to try running. Perhaps you’ve only done phone contesting; try CW. Etc.

The problem with real contesting is in self-evaluation. There are too many variables beyond your control: QRN, solar cycles, rain static, etc. As in the world of AI, the more data you have, the better you can understand the domain. Yet a particular contest—take ARRL CW Sweepstakes as an example—happens only once a year. Wouldn’t it be nice if there were a contest that happened a hundred times more often? It turns out there is one—CWOps Tests (“CWT”s)!

The nay-sayers will now voice various objections: CWTs are not “real” contests, they do not have log checking, most of the participants use call history files, packet assistance is not a “boy and his radio,” etc. This is all true. But they offer useful real-world experience of high speed CW call sign copying, and can be used to practice SO2R, 2BSIQ, pileup handling, and other techniques. Most importantly, they’re fun, fast-paced events.

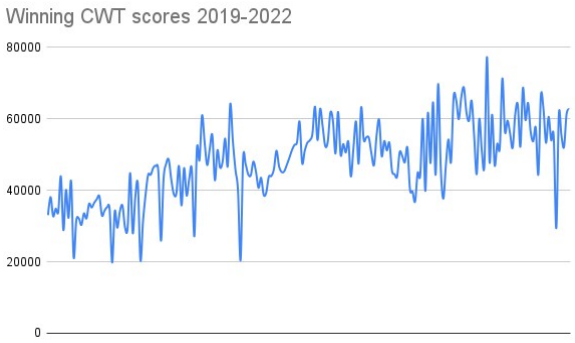
But do they actually help improve contesting skills? More generally, do contesting skills improve after the initial rapid learning phase? Or does a contester quickly reach a plateau dictated by innate talent?

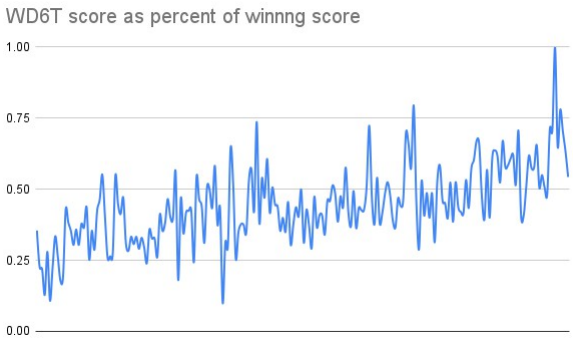


I will use myself as a guinea pig to try and answer that question. For several years, I have been participating in CWTs every Wednesday. I usually do only the 1900z and 0300z contests. To obtain the data from these contests, I enlisted the help of Matt WX5S, who wrote code to extract data from the WA7BNM 3830scores.com web site. I focused my attention on those CWTs that I participated in during the period from January 2019 to December 2022. I further narrowed down the data by including only those done from the same station (N6RO), and for which I was able to operate for the entire hour. The result is approximately 200 data points. Below is a graph of these scores

The first thing to notice is how noisy the data is. There are over 200 points in this graph. (Gathering this much data on my performance in ARRL CW Sweepstakes would have taken 200 years!) If I had only a handful of points, the noise would swamp out any useful information. But with this much data, it's pretty clear that there is an upward trend.

But how do we know if I actually improved or if there were just improved conditions or more participation? It is undeniable that CWT participation has increased, but by how much? Let's pick a random date.... mid-October at 0300z. On Oct. 17, 2019, the top scorer was N2NT with 192 Qs. A year later in 2020, AA3B had 251 Qs. In 2021, K3WW won with 213 Qs. And in 2022, the winner was again AA3B with 235 Qs. So after an initial "Covid bump," the high score, and by inference participation, has remained relatively flat. Here are the winning scores for the CWTs in which I participated:





Now
let's look at the ratio of my score to the winning score:

An upward trend is again evident, as the score increases from 25% to nearly 75% (and includes one win). This suggests that indeed all this practice has led to some improvement in skills.

But as the financial disclaimer goes, "past performance is not a predictor of future results." There's no way to know if there's a hard-limit encoded in my DNA and if so, what it is.

Meanwhile, aging is acting as ballast, pulling in the opposite direction.

Of course, high-speed call sign recognition is only one of many contest skills. Others include endurance, consistency, pileup handling, and knowledge of DX propagation. Each of these can probably be isolated and practiced systematically, at least to some extent.

What about that "stage fright"? Is there an analog in contesting? New hams often experience "mic fright." Similarly, in a contest, it's easy to get flustered, psyched out by the competition, or otherwise distracted from the task at hand. As with music, the important thing is to get back into the flow of the activity itself. Any other thoughts are counterproductive distractions. But, what about paying attention to what your competitors are doing? Would you consider that a distraction or a motivation? It depends on what kind of a racehorse you are. Some contesters are like Secretariat, they do best if they keep the blinders on and run like hell. Others are more like Sea Biscuit and do best without blinders, driven forward by competitors nipping at their heels.

One final caveat: This column has focused narrowly on operating skills and behavior. Even more important to contest score are the QTH (terrain and location in the world) and the station capabilities (antennas, SO2R, amplifiers, and so on.) The fact that there are so many elements that go into contesting is what makes it so compelling. What's your New Year's Resolution? Practice? Maybe. Improve your station? If at all possible. Most of all…

Have fun contesting in 2023!

Vice President/ Contest Chair Report

Andy Faber, AE6Y

Ringing in the New Year: The last few weeks have really been defined for most of us West Coasters by the weather. As I write this column, I'm sitting in a cold house in which, thanks to our incompetent utility company, the power has been off for the last 42 hours or so. I don't exactly live in the woods – just slightly off Highway 9 in Monte Sereno about a half mile from Downtown Los Gatos, but the power went off in the middle of the night, early Tuesday morning and is still off, though I notice driving home from work in SJ (where my office has heat, power, and internet – all of which I'm missing here at home) that it seems that the bottom half of my street has power. I don't know why my part wouldn't have it also. And this is on top of a 16-hour outage last week.

Two of my neighbors clearly have large generators, which I've heard humming away from the start of the power failure. I have only two small 1 kw generators, a Honda 1000 and an old Coleman powered by a Briggs & Stratton one-lunger. The Honda is purring away on the front stoop, with 75-feet of extension cords powering lights and the computer. But it won't power the whole house, and if the outage continues for another day I anticipate significant spoilage of frozen food and possibly fresh food in the refrigerators. It seems like buying a 10-15 kw outdoor generator might be a sensible purchase – I had never thought so before, as it was rare for the power to go off for more than a few hours at a time. And the State wants us to go all electric (to which my reply is, OK if you can also get us a company that furnishes reliable electricity).

Back to the weather, obviously I have nothing to complain about compared to those who may have endured significant damage due to wind or rising water. But it's been weird. My wife and I drove to Portland on Dec.

22d for the Holidays. Getting through Siskiyou Pass (elev. 4,300 ft.) in Southern Oregon is always a worry that prompts us to carry chains, flares, etc. This year it was no problem with only rain, but as we got about to Eugene, 100 miles south of Portland, the temperature kept dropping and the rain turned to freezing rain . We had to stop twice to scrape ice off the wiper blades , and even then visibility and traction were sketchy.

In Portland the temperature got down to 15 degrees that evening, most uncharacteristic for them, and the drive of a few miles from our kids' house to our hotel at the airport was harrowing. The next day was also pretty bad, and we could see out or hotel window that the airport was closed down tight for about two days. It could have been worse, of course, if we had been flying, particularly on Southwest. Anyway, it did warm up and eventually the ever-present rain washed away the snow and ice so we were left with typical Portland December weather: cold and rainy. We drove back on the 31st, the day of a very bad storm in the East Bay that actually closed 580 for a spell.

The New K4: I've been a devoted Elecraft K3 user since 2007, and that first unit has been my number one shack radio ever since, upgraded to K3S standards a few years ago. I love its quality, features and performance. In particular, the small size that allows me to stick it in a backpack to take on the plane to Aruba is delightful (and we have another unit at our P40L/P49Y station there as well). Some things about it are not ideal, particularly the limited display. My second shack radio, an IC-7600, has a much more colorful and useful display, though it's not a touch screen and the radio itself is not nearly as good a CW contest radio as the K3.

The K4 has been a long time coming. I remember being tipped off that something great was just around the corner at Visalia in 2017! As we all know, the imminence of the K4 was overestimated by several years due to a variety of problems none of which were really the company's fault. They've now been out in circulation for a while, and last Friday, during a rare break in the weather, I drove out to Watsonville to pick up my very own K4D.

My prior experience with the K4 results from the kindness of Rick (N6XI) and Elecraft, who allowed me to take his field test unit to Aruba for WPX CW in May 2021. It was a great pleasure to use his radio. Obviously Elecraft has cured the display deficits of the K3, with a beautiful, informative display that can be used as a touch screen or with a mouse. The K4 is slightly larger than the K3, so that it no longer fits in my backpack as the K3 does, but I found that wrapped in some protective insulation it fits nicely into a carry-on suitcase. One of the nice features of the K4 that I noticed in that operation is its backward compatibility with the K3's interfacing. So if you are using devices with a serial output or even a 15-pin accessory connector on the K3, they will also work seamlessly with the K4. And the K4 also offers more advanced connectivity, including several USB ports if you want to use more modern tech.

I haven't had much chance to operate my new one yet, and the power outage isn't helping in that regard. I do hope to use it as radio number one in my SO2R setup in NAQP CW this weekend, lord willing and the power comes back.

As was true for the K3, the K4 has been subject to a continuing upgrade process, primarily in software (though I assume there have been some hardware upgrades also). I plan to take mine to P40L/P49Y for ARRL DX SSB Contest and am looking forward to using it as a phone rig. As part of the improvements I mentioned, I note that two features that should be very helpful in that contest have been added during its evolution: implementation of pre-recorded voice memories and using CESSB, a method of voice compression said to offer a several dB

improvement over conventional compression without introducing distortion.

CESSB is a fascinating subject, but if you try to understand it from W9GR's 2014 article in QEX, you may rapidly get mired down in mathematics. Here's what Wikipedia says about it:

> *"CESSB (controlled-envelope single-sideband) is a narrowband modulation method using a single sideband, whose peak envelope level is controlled so that the peak-to-average power ratio of CESSB is much reduced compared to standard SSB modulation and offers improved effective range over standard SSB modulation while simultaneously retaining backwards compatibility with standard SSB radios."*
>
> *"A drawback of standard SSB modulation is the generation of large envelope overshoots well above the average envelope level for a sinusoidal tone (even when the audio signal is peak-limited). In combination with RF amplifiers with non-linear properties this causes severe distortions of the transmitted audio signal. Therefore, the average RF power level must be reduced in order to accommodate the overshoots."*
>
> *"The standard SSB envelope peaks are due to truncation of the spectrum and nonlinear phase distortion from the approximation errors of the practical implementation of the required Hilbert transform. It was recently shown that suitable overshoot compensation (so-called controlled-envelope SSB, or CESSB) achieves about 3.8 dB of peak reduction for speech transmission. This results in an effective average power increase of about 140%."*
>
> *"CESSB is being used experimentally by amateur radio operators and is implemented by some radios in the amateur marketplace. SmartSDR software by Flex Radio Systems implements CESSB, as does the Elecraft K4 transceiver."*

I'd be very interested to hear what current users of Flex and K4 radios have to say about CESSB.

ARRL RTTY Roundup: NCCC has owned this contest for the last ten years or so, winning it almost every year. However, early results suggest that we seem to be engaged in a tussle with PVRC. Dave, WD6T, did a great job as the contest flogger, and we did get enough logs to qualify as an unlimited club – but there were a number of operations that resulted in "participation" logs, i.e., logs to help the club log total but without a serious effort to make a good score.

Yours truly got on for about eight hours and had a lot of fun, though I think I qualify for the award for the most primitive RTTY user in the Club. I've never really gotten into RTTY, and so have never set up the radios and logging program the way they should be set up to operate that mode. I employ a very primitive strategy of just sending RTTY using a keyboard plugged into the 7600, using the function keys for most sending, except for having to type in the station's callsign for the exchange. Meanwhile, I'm also keyboarding the callsign into CQPWIN to keep the log. This also means using the radio's built-in decoder, which actually works fine on strong signals. But the text on the screen seems to be getting smaller each year!

Conditions on the high bands were very good, with 10 open for many hours at a time. I'm hoping that the sunspots show up similarly for ARRL Phone in March, as it can be delightful to run US/VE on the wide-open spaces of 10 phone, where one is generally free from the hysteria caused by the EUs running in the limited

bandwidth of 20 meters. There were many outstanding scores put up by club members in all categories for single ops and multis. It's nice to have a contest we can actually win from the West Coast for a change.

NAQPs Coming Up: Though it may be too late to cheerlead for NAQP CW coming up on Jan. 14 local time, I want to encourage us to get out for both NAQP CW and for NAQP SSB the next weekend. These are great Club activities, ably flogged these days by none other than our esteemed JUG editor, Skip, K6DGW. Our teams have won or placed well in many years, and the West Coast generally can be quite competitive. Some very nice features of the NAQP contests include:

1) They are low power only. This allows you to turn off the amp (or compete on a level playing field if you don't have one) and also reduces the bedlam caused by lots of high power stations competing for contacts.

2) They use all six contest bands 160-10. Because the exchange is invariant, just name and state, if you've worked someone on the high bands, you can also make a contact on 80 or 160 even if you can barely hear them well enough to make out the call.

3) They are very good SO2R practice. It's fun to run on one band and look for Qs and mults on another.

4) They are also good for practicing moving mults, since mults count once per band. This is particularly easy on phone due to the naturalness of phone operation. And because it's low power, for most folks, qsying is easy as long as the have an antenna for both bands. One year I tried aggressively moving mults in the phone contest. This does have it its risks. As Woody Hayes famously said about the forward pass in football, "There are three possible results and two of them are bad." The same is true for moving mults, where the bad results can include losing your run frequency or wasting time on an unsuccessful move. Furthermore, even successful moves may not be helpful in the sense that you might work the same mult later from another station on the second band. But it is very satisfying to both stations when the move results in a successful contact on the second band. And it may even be possible to do a double move to two new bands. After moving about two dozen stations in that contest, I calculated that the net improvement in score was about 5%. That may or may not be worth it depending on your level of seriousness, but it can be enjoyable to experiment.

5) The contest is friendly, particularly the phone version where it is common to greet and be greeted by name, since that is part of the exchange. This makes it seem less of cut-throat contest than some others.

6) So sign up for a team with Skip and enjoy the NAQPs.

Upcoming Contests (dates are PST):

Jan. 14 NAQP CW
Jan. 21 NAQP SSB
Jan. 27 CW 160m Contest CW
Feb. 4 NCJ Sprint CW

Mar. 4-5 ARRL DX SSB
March 25-26 CQ WPX Phone (A Focus Contest!)

Awards/Event News

Local Kid Does Good

Nothing like keeping it in the family. Bob, K6XX, received the plaque on the left for the winning combined score in the 2022 CQ WPX Contest. Apparenly he does, in fact, own a microphone. Congratulations Bob!

NCCC sponsors this trophy, even if our full name is misspelled just a tiny bit.

AD6E/K6XX To WRTC

[*Ed. Note: A little late due to COVID-19 postponement, the WRTC will be held this year in Italy. From way out in the Pacific comes this note from a Maui resident we all know*]

"As many of you know, my neighbor Kent, KH6CJJ, was selected to be Team Leader for Hawaii which is area OC2. I came in second in the qualifying and Kent chose me as his Teammate. He lives about 1/2 mile south of me. He did extremely well during the qualification period with a small tribander at 35 ft and a G5RV wire for the low bands."

"Due to problems beyond his control, Kent has decided to drop out of the competition. I've known this was probably going to happen for several months but he finally made this decision and he notified the Italians. So, since I qualified as #2, I'm the new Team Leader and I have chosen Bob K6XX to be my Teammate. This is now on the WRTC website." *https://www.wrtc2022.it/en/competitors-24.asp* "I'm very happy to see that NCCC made a tent donation applied to our team."

Mahalo nui loa & 73, Alan AD6E / KH6TU

WRTC Special Event Station – N6W

We are looking for operators to activate the Special Event callsign N6W as part of the World Radiosport Team Championship (WRTC) World Wide Award Activities. The Award Activities program is organized by the Italian WRTC Organizing Committee and is intended to publicize the actual WRTC competition which will be held in

Italy in July. Approximately 40 special event stations will be active worldwide from 00:00Z on January 1 through 23:59Z on January 31, 2023. Most will use the "WRTC" suffix (e.g., E2WRTC from Thailand or LZ0WRTC from Bulgaria); we in the USA will be using the ten 1x1 callsigns N0W through N9W. The Italians are offering lots of awards to stations working the Special Event callsigns, so the pileups should be large! You can find info about the Awards Program here: https://www.wrtc2022.it/en/wrtc-2023-award-31.asp

The callsign N6W has been reserved for stations operating from within the WRTC's "NA9" selection area. NA9 is that part of North America comprised of the states of CA, AZ, NV and UT. Activity will be on CW and SSB on the 80m, 40m, 20m, 15m and 10m bands. These are the same modes/bands which the WRTC teams will use during the actual competition in July.

The more stations we can get on the air in January using N6W the better, so if you'd like to join in the fun and experience the pileups, please sign up as an operator yourself and also pass along this invitation to your friends and clubs located within the NA9 area. All one needs to do to sign up is send an email to w6oat@sbcglobal.net saying you'd like to be an N6W operator and include an email address to which I can send you additional information.

The Italians require that all QSOs made with the special events callsigns be uploaded in real time to their online scoreboard. For the QSOs you make as N6W, that means you'll need to have an active internet connection, usually be running the N1MM logging program, and have a valid email address listed on your QRZ.com web page. I'll send all the details about how this works to everyone who signs up to be an operator. What this means, though, is all you'll have to do is concentrate on making QSOs. You will not need to worry about QSLing for any of the contacts you make or even fooling with logs after you end your operating session. This will be a lot of fun. I hope you will join us in making N6W the most active of all the special event stations worldwide!

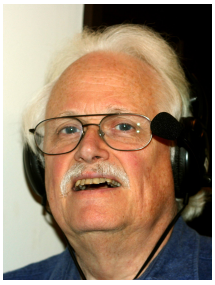
Rusty Epps, W6OAT
NA9 Coordinator

Planning Antenna Systems For the Little Gun Station

Jim Brown, K9YC

Part 2

[*Ed. Note: All of the figures referenced in this part of Jim's article are collected at the end of this issue to permit viewing them in a separate window while also reading the text*]



Our next antenna, a 10M vertical ½ λ dipole, is modeled with its base 6 inches above ground, and at 33 ft. Results are shown in Figs 15, 16, and 17. Here, elevating the antenna is a major improvement for all ground types, and for almost all vertical angles.

Next, I studied the issue of radials for a half-wave antenna. It's a commonly held belief that half wave antennas do not need radials, but a search of ARRL technical publications will find statements to the contrary (ON4UN book, for example). I modeled a half-wave center fed 20M dipole built with 3/4-in diameter Al tubing, mounted 1 ft above ground, with and without 32 half-wavelength radials. Radials are laid on the ground and are connected only to each other in a star configuration. Results are shown in Figs 18-20. Increased radiation is greatest for the poorest soil and for higher vertical angles.

We're now in a position to summarize the results of our study. 1) A vertical antenna mounted above ground in the range of ¼ λ will generally outperform the same antenna mounted in close proximity to the earth. 2) Improvement will be greatest for the poorest soil conditions. 3) Improvements will be greatest at low radiation angles. 4) At heights above about ¼ λ , lobes and nulls develop in the vertical pattern that are most pronounced with very good soil. 5) In general, there is little benefit to increased mounting height of antennas over sea water. The result of Fig 21 is typical -- while low angle radiation increases by a dB or so, lobing at high angles becomes more pronounced with increased mounting height.

The next question is, why do vertical antennas work this way? As I see it, there are three primary effects, the first two of which are included in the model. 1) Fields produced by vertical antennas, including their radials, induce currents in the lossy earth. These losses are greatest when the antenna is near the ground, and decrease the overall strength of the radiated signal. As the antenna is elevated, these losses are reduced, because the EM field, and the resulting current, are being returned to the antenna (the radials or the other half of the dipole) rather than to lossy earth. 2) The EM field radiated by the antenna hits the earth at some distance from the antenna, is reflected by the earth, and the two wavefronts, direct and reflected, add to produce the vertical pattern. At vertical angles where they are most nearly in phase, they add to increase the signal strength, and at vertical angles where they are close to 180 degrees out of phase they produce a null. Lobes are strongest, and nulls are deepest, when the direct and reflected waves are more nearly equal in amplitude at the 0 and 180 degree phase angles. 3) The horizontal and vertical pattern of any antenna is distorted by surrounding conductors -- often called "ground clutter" -- and additional losses may be introduced. This effect is difficult to model, and no attempt was made to do so, but it's safe to assume that it is reduced by elevating the antenna.

Elevating Verticals -- the Practical Side: As noted earlier, multi-band HF verticals tend to fall into two generic types -- base-fed verticals that require radials, and center-fed verticals that do not. When ground-mounted, many

radials are required, but length is not critical – 32-¼ λ radials laying on the ground is generally within a dB or so of optimum. Radials serve to "shield" the fields produced by the antenna from the lossy earth, and they carry the antenna's return current. The return current divides approximately equally between the radials, and losses equal to I^2R are induced. The more radials, the lower the loss, because power is current squared. Also, the fewer the number of radials, the less likely the current will be equally distributed, which also increases the loss.

When radials are elevated, fewer radials are needed to equalize the current, and the increased height reduces coupling to the lossy earth. Four ¼ λ radials are sufficient for verticals at least 1/8 λ above ground, and modeling suggests that two ¼ λ radials per band are within a dB or so of optimum for multi-band verticals if those radials are distributed radially around the feedpoint. But that's still a lot of radials, so elevating a base-fed multiband vertical is a non-trivial effort.

Center-fed verticals are far easier to elevate because they do work without radials, and because elevating them reduces ground losses to the extent that radials have little effect. Some examples of center-fed multi-band verticals are the Gap Titan, Force 12 V3 and ZR3, HyGain AV620, AV640, and AV680, Cushcraft R6, R8, R9.

End-fed verticals can be mounted on towers with little effect on their performance as long as they have radials but do not work well when mounted on towers without radials using the tower as a counterpoise -- the tower becomes part of the antenna and seriously degrades the vertical pattern.

Center-fed dipoles mounted on towers present a special problem. They must be insulated from the tower, but the feedline must come down the tower, and the capacitance between the feedline and the tower couples it to the tower. In addition, good practice for lightning protection of the feedline calls for the feedline to be bonded to the tower at top and bottom, which also couples the antenna to the tower. With this coupling, the antenna is vastly different from its original design, and its performance is likely to be poor.

Losses in Multiband Antennas: My models are for fundamental antenna types, where losses are minimal. The various engineering techniques used to create a multiband antenna often add loss, whether due to the resistance of traps or increased current in matching sections. The radiation efficiency of any antenna is limited by the simple voltage division between the radiation resistance, R_R, (good resistance that accounts for radiated power) and series loss resistance (conductor resistance plus ground resistance). Radiation resistance increases with physical length as a fraction of a wavelength; R_R is about 37 Ω for a ¼ λ antenna, but falls to about 7 ohms for a 1/8λ radiator. We must keep these factors in mind when comparing one antenna to another, and these efficiency differences are essentially what the N0AX/K7LXC tests were measuring.

And there's yet another factor at play -- when an antenna is physically short, e.g. a fraction of a wavelength, the current must be increased (by means of a matching network) to maintain the same radiated power, and the increased current increases losses. This means that short antennas can benefit even more from being mounted higher because the coupling of the increased current to lossy earth is reduced. Figs 22 and 23 show the extreme case -- a 4 ft tall center-fed dipole on 20M at heights of six inches and at 30 ft. Most multiband antennas will be subject to this factor -- that is, they may benefit a bit more from being elevated than suggested by my models of near-ideal antennas.

Reduced Losses and Impedance Matching: It's well known that many antenna designs "use" the ground loss component of the feedpoint impedance to bring that impedance closer to 50 ohms, so when losses are reduced by elevating the feedpoint, the SWR may rise a bit. Not to worry -- the small additional loss in the line due to

mismatch is much less than the efficiency gained from elevating the antenna. Smart hams also know that the most important reason to use big coax is to reduce loss. This is especially important when running low power or with a compromised antenna system. Indeed, the only good reason for using small coax is to minimize visibility from neighbors (or an XYL) with an attitude!

Comparing Verticals with Horizontal Dipoles: Now that we know a bit more about what can be done by elevating a vertical, the obvious question is, how do these verticals compare with a conventional horizontal half-wave dipole? We'll begin by studying the effect of ground quality on a horizontal dipole for 40M. Fig 24 shows that at low vertical angles the difference is negligible -- only 0.6 dB difference between the best and worst soil types, and an improvement of about 2 dB for the best soil at NVIS.

Height of Horizontal Antennas: The most important characteristic of a horizontal antenna is its height above ground. Fig 25 compares the vertical pattern of a 40M dipole at heights of 33 Ft, 43 Ft, 53 Ft, 63 Ft, and 73 Ft. As the antenna is raised, high angle radiation is suppressed and low angle radiation is enhanced. For most contesting, a higher dipole is a much better performer! Fig 25 can be scaled by wavelength -- that is, to predict behavior of a 20M dipole, divide heights by 2, for 80M, multiply by 2.

Now we're ready to compare verticals and dipoles at mounting heights that are practical for many hams, even on small lots. Figs 26-28 compare a horizontal 40M dipole at 33 Ft with a simple 40M ground plane at 6 inches and at 33 Ft. For all three soil types, the vertical at 33 ft outperforms the horizontal dipole at low angles, at the sacrifice of high angle radiation, ***in the main lobe of the dipole***! Off the ends of the dipole the advantage of the vertical at low angles is even greater depending on soil type. Again, this is broadside to the horizontal dipole -- off axis of that, the vertical has a greater advantage. Note also that the high angle radiation of the vertical dipole doesn't fall off as much as for the 40M antenna. Again, remember that these models are for near ideal antennas -- the efficiency of practical multiband antennas reduces their performance by a dB or two.

What About a Small Beam? To estimate its performance, add 4 dB to the advantage of a horizontal antenna for a small beam without traps at the same height (only 2-3 dB if there are traps). And remember that its directivity can reduce noise and QRM, so it may help us hear the weak ones. For a simple 2-element vertical array, add 3 dB over the performance of a single vertical.

Getting Practical -- Where Can I Put Antennas? Now that we have a good idea about how various antennas perform, we're back to where we began. We can start looking at the possibilities that our real estate (and the attitudes of XYL and neighbors) permit. What do we have for skyhooks? Can we launch a rope into a tree to support one end of a dipole? Will a building support one end of an antenna? Can we safely mount a multiband vertical on the roof of our home or garage? Can we route a feedline from the proposed location to the shack? How close would the proposed antenna be to noise sources? To our neighbor's living room entertainment system? What are the best orientations for horizontal dipoles based on where the QSOs are? Do I need much high angle radiation?

Experimental Confirmation of Modeling: Signal strength measurements were made with the dipole center at ground level and the feedline laying on the ground to form a quarter-wave vertical with a single radial; then with the choke 6-inches above ground level, forming a half-wave dipole with its base 6-inches ground level; then with the dipole raised in 10 ft increments to a maximum height of 40 ft above ground. My RX antenna was a 20M vertical with two radials laying on the ground. Results are shown below.

References:

"HF Vertical Performance- Test Methods and Results,"
H. Ward Silver (N0AX) and Steve Morris, K7LXC, Champion Radio Products, 2000

"Collected tutorials"
Rudy Severns, N6LF" http://www.antennasbyn6lf.com/

Some Notes on RTTY Signal Quality

Gary, NA6O

We all want a clean RTTY signal, and it's important to know some of the factors that affect that. What I'm considering here is only AFSK (audio frequency shift keying), where the signal is produced by audio modulation not much different from SSB or the FTx modes. Hardware FSK is a different beast, and we'll leave that for another article.

MMTTY Transmit Bandpass Filter: For those that use MMTTY for RTTY signal generation via AFSK, there is a setting that not everyone knows about. In the MMTTY Options menu, open the Setup MMTTY dialog, and switch to the TX tab (Fig. 1). There you will find a the TxBPF (transmit bandpass filter) settings. Be sure the TxBPF box is checked, and set the Tap value to at least 128. You can click the little "f" button to plot the filter response.

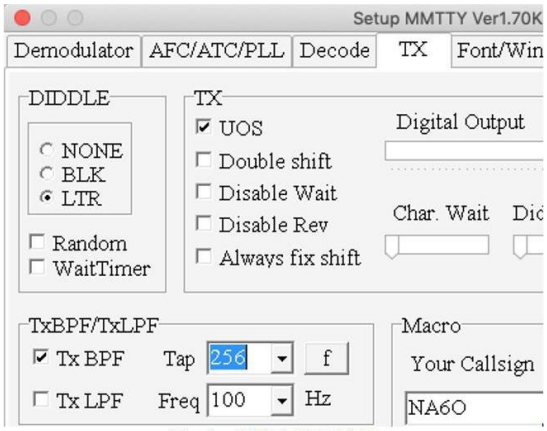
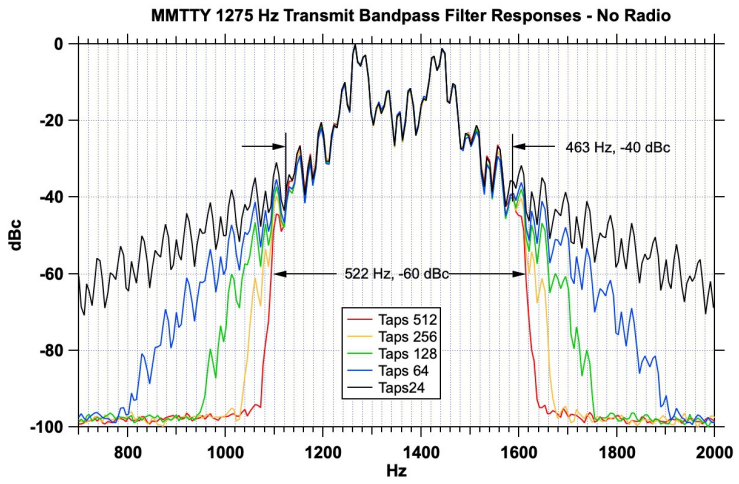


Fig 1 – MMTTY TxBPF



The number of taps refers to the length of the digital filter processing buffer in an FIR (finite impulse response) filter. Having more taps is similar to having a higher order analog filter with more L and C components and allows sharper filter skirts. This higher-order filter will make MMTTY produce a cleaner modulation signal.

In Fig. 2 at the left, I have plotted the actual TxBPF responses for several of the possible settings. Adding more taps clearly reduces the wideband energy. What's the cost of adding more taps? More CPU processing effort. But on today's computers,

it's truly negligible. So this is a simple conservative practice to provide your transmitter with the cleanest possible modulation signal.

Adjusting Audio Levels: The *really* important setting is the audio modulation level in your transmitter. This is adjusted in several places, which adds more places for Murphy to strike.

1. Windows Sound settings control panel. The sound output device that you are using has a Level control. In MMTTY, there is a menu option that takes you right there: Option >> Soundcard Output Level.

2. The Mic Gain setting on your transmitter. (This may have a different name, depending upon your radio.)

3. If you're using a Flex 6000, there's also a level setting in the DAX control panel.

4. If you're using an external audio DAC such as a Tigertronics SignaLink, it may have a knob that adjusts the transmit level as well. Put some tape on that sucker.

All of these are "in series." The worst possible setting is where the first level setting in the chain is way too high, causing something downstream to clip. Disastrous distortion! Your objective is to deliver a clean modulation signal, and to carefully watch the AGC level on your transmitter while gradually increasing the audio level.

I generally start with the Mic Gain knob at 50% or so and the Windows Sound control panel open, with the Level slider fairly low. In MMTTY, there is an RY button that makes it transmit continuously until you click TXOFF. Bring up the Level slider until the proper AGC level is achieved. On the K3, that's four bars steady with the fifth bar flickering. On most radios, it's where the AGC indicator just barely starts to move but check your manual. After this initial setup, you can dispense with all the many level adjustments and only use the handy Mic Gain for small tweaks.

There is one other thing to check in the Windows Sound control panel: Disable the "Spatial Sound" or other effects. This so-called feature adds all sort of mysterious distortion to audio outputs. You need to get to the lowest-level "additional device properties" dialog to set disable this. And another warning: Windows Updates are notorious for obliterating sound settings, along with COM ports. Always re-check! No wonder I'm a Mac guy.

Radios That Have AFSK Filters: There is another important feature in some radios for AFSK RTTY: An audio bandpass filter, tuned to the selected RTTY modulation frequency. On the K3, you activate it via the AFSX TX menu (it's either on or off). The Flex 6000 automatically does this filtering; I can't speak for other radios. The only drawback to these filters is that you must set the AFSK frequency for the radio to match what you have chosen in MMTTY. If they don't match, you get *no signal at all*. Many have been hopelessly confused by this. Audio in, but nothing out.

This radio-based filter performs the same function as the bandpass filter in MMTTY. Is it redundant? I say no, and here is some evidence. (Fig. 3). I measured the output of a K3 set at 25 W (typical for driving an amplifier) with a spectrum analyzer. A plain carrier is shown for reference and you can see the increase in energy over the full 2.7 kHz transmit bandwidth of the radio when a RTTY signal is applied. What's important is that the extra

peaks that appear in the red trace are eliminated by the K3 AFSK filter.

The Dirty DAC: But it gets even better. What happens if your audio source (DAC) happens to supply signals outside of the audio spectrum? One would think that it would never happen, and even if it did, surely the radio would not respond. FALSE!

As a lifelong analog engineer, I learned to test everything well beyond its ratings, expecting the unexpected. So connecting an RF spectrum analyzer to the output of an audio DAC is definitely my style. Also, I had seen "something funny" when I connected a Behringer UMC-404HD to my K3: Extra distortion on the rig's output. I had on hand several DACs and tested them all. Here is what I found.

The spectrum at the left shows significant RF output on the UMC-404HD outputs, starting below 100 kHz and extending out to several MHz. Even worse was a little Behringer UA202. The signal you're seeing is characteristic of a modern oversampling DAC where the designer failed to include the mandatory lowpass filter. I looked at the circuit board in the 404 and it was obvious that they had in fact not bothered to implement a proper filter. This is unconscionable and incompetent on the part of the designers. Jim, K9YC, serves on an Audio Engineering Society standards group, and will be using this as evidence for stricter standards.

I also checked the built-in audio outputs of my MacBook, a rackmount computer, a Dell laptop, and an Asus Xonar SE PCI board. All were squeaky-clean. But that noisy DAC was driving my K3 nuts. I saw all sort of unexplained spurious audio signals on the rig's output. What must be happening is that this directly-injected RF energy into the Line In of the K3 is coupling into the modulation subsystems. Here again, I found that turning on the AFSK filter in the K3 completely eliminated the distortion. So that it is another reason for enabling that filter.

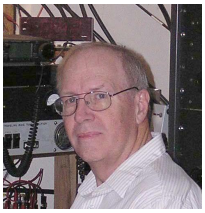
The Final Test: Your final defense against dirty RTTY signals is to have a friend listen to you on the air, preferably with a waterfall display and a receiver that is not overloaded. And don't forget to do it *before* the next contest!

Tube of the Month

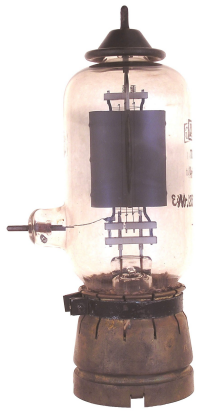
Norm N6JV

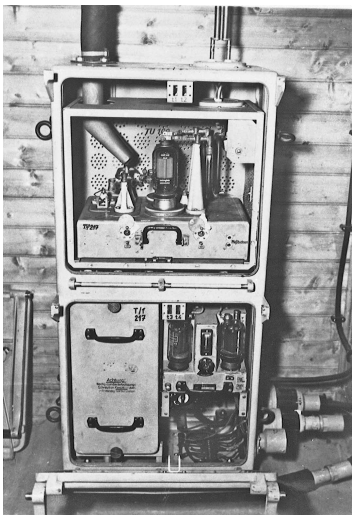
[Visit the Tube Museum at *n6jv.com*]

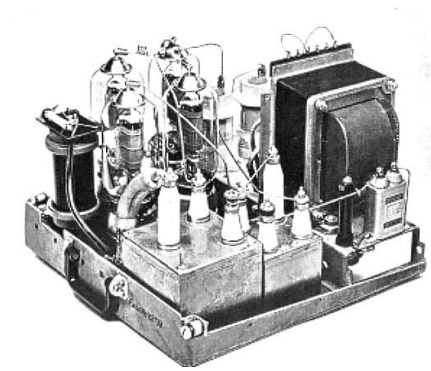
TS41



When I started getting serious about collecting transmitting tubes, there was little information that was readily available especially on foreign and military types. The development of the Internet and the search engines inspired me to build the museum collection and finally allowed me to do research on tube identification and the applications where they were used. Recently, while researching German RADAR, I came across the schematic of the German Freya transmitter. It shows the use of the TS41 triode in the power oscillator. In 1934, what would be called RADAR and SONAR, were being researched by the German Navy. None of the large electronic equipment makers were interested in the project, so a new company was organized to develop the systems. The new company was called the Gesellschaft für Elektroakustische und Mechanische Apparate or GEMA. By the beginning of WWII, GEMA had produced a variety of equipment including the Freya RADAR. The pair of TS41s that was used in the output seem to be a type designed by GEMA. The example I have was made in 1943 by Allgemeine Elektricitäts-Gesellschaft or AEG that was the German equivalent of General Electric. Several other manufacturers made the TS41. The photo is of the power output stage of the Freya with the modulator on the bottom.







The TS41 is a 150-watt triode that operated up to at least 190 MHz. The pulsed anode voltage is 8kV at a current of 5 amps. The pair in the Freya had a pulsed output of about 20 kW. The filament ran at 10.5 volts at 11 amps. The base is a special unit with three banana plug sockets for filament and ground. The glass is attached to the base with a hose clamp that is cushioned by a strip of asbestos which is typical for German transmitting tubes. There is a corona shield built into the anode pin. The tube was capable of handling higher voltage and later Freya units had a better insulated amplifier deck to produce higher output. The TS41 was also used as a pulse modulator (Hochtast Gerät) as seen in the third photo.

Editor's Notes

A big thanks to our contributors this month! Newsletters like the JUG need and thrive on larger efforts such as Jim's and Gary's, but recurring columns such as Norm's "Tube of the Month" are also a staple. We need more of these, accompanied by folks who will collect and organize the information.

Any historians out there? At 52 years, NCCC has a rich history going back much farther than most members have experienced. Silent Keys? How about "Station Activities?" I once gathered a potpourri of mildly interesting, sometimes distantly radio-related things for "*Miscellaneous Radio*" -- "Franklin Antennas, Outphasing, and Rush Limbaugh in one sentence?" and "Megawatt LORAN-C Transmitters With No Power Amplifiers" were two. You likely have much better ones than I dug up. You could acquire a measure of fame by taking on a recurring column for the JUG … fortune? ... well, not so much. Ideas/volunteers are welcome!

Photo: 2Lt, Apr 1963, Galena AFS, AK/Credit: TSgt Johnny Rainbolt

What Am I?

Answer next month

NCCC Membership Information

If you wish to join NCCC, please fill out an application for membership, which will be read and voted upon at our monthly meeting. To join, you must reside within club territory which is defined as everything in California north of the Tehachapi's up to the Oregon state line, and part of northwestern Nevada (anything within our ARRL 175-mile radius circle centered at 10 miles north of Auburn on Highway 49).

Life Memberships

Life memberships are $250.00 Contact secretary.nccc@gmail.com. Members who have reached 80 years of age have and been an NCCC member for 20 or more years are eligible for Honorary Life Membership ("80/20 Rule"). Contact secretary.nccc@gmail.com

JUG Articles Wanted!

The JUG is produced using Apache Open Office templates/macros so the best way to submit material is plain old ASCII text with separate files for photos, diagrams, etc. You can indicate their location in the text by inserting <*filename*> in your text. Indicate desired text formatting with XML-ish tags such as <bold>...</bold>. A selfie the first time you contribute is appreciated. The plan is to get the PDF file to John before the monthly meetings. Please do not spend time formatting your submittal, the publication templates will re-format everything anyway. Send your material to *k6dgwnv@gmail.com* indicating "JUG Submittal" in the subject.

Northern California Contest Club Reflector—Guidelines

The NCCC email reflector is devoted to the discussion of contesting. Topics include contests, station building, dxpeditions, technical questions, contesting questions, amateur radio equipment wants/sales, score posting, amateur radio meetings/ conventions, and membership achievements. Postings may not include personal attacks, politics, or off-subject posts. Such postings will be considered a violation of the Guidelines

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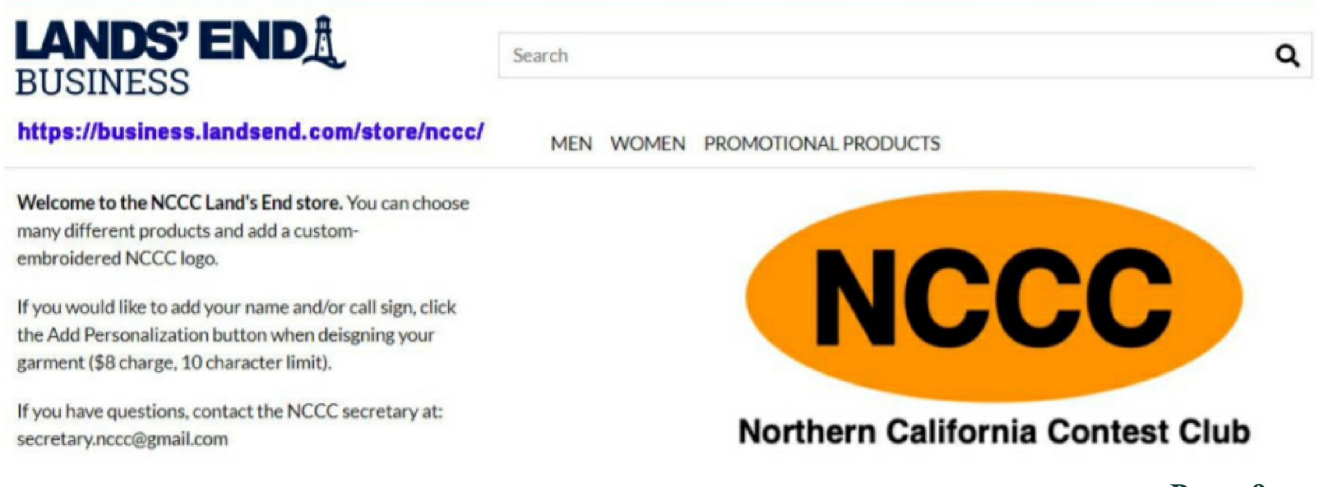

NCCC Lands' End Store

We are pleased to announce that the new NCCC Land's End store is online! You can choose from an array of shirts, jackets, and hats and apply your choice of custom-embroidered NCCC logos: A plain one, or one that also says Fifty Years. And, you can personalize your item by adding your name and/or call sign. The store is open 24/7 and items are shipped directly to you. No more waiting for everyone else to make up their minds on a group purchase.

https://business.landsend.com/store/nccc/ or from the NCCC website: http://nccc.ccc/members/lestore.html
Thanks to W6TCP for helping to set this up. Instructions for purchases from Lands' End NCCC Store

1. Go to https://business.landsend.com/store/nccc/
2. Click on Men's or Women's link, then choose item(s)
3. Pick color, inter quantity of each size you want to order.
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• Color display-green, blue, orange, purple, gray • GPS/APRS • Packet 1200/9600 bd ready • Spectrum scope • Bluetooth • MicroSD slot • 500 memory per band

FT-70DR *C4FM/FM 144/430MHz Xcvr*

• System Fusion Compatible • Large Front Speaker delivers 700 mW of Loud Audio Output • Automatic Mode Select detects C4FM or Fm Analog and Switches Accordingly • Huge 1,105 Channel Memory Capacity • External DC Jack for DC Supply and Battery Charging

FT-5DR *C4FM/FM 144/430 MHz Dual Band*

• High-Res Full-Color Touch Screen TFT LCD Display • Easy Hands-Free Operation w/Built-In Bluetooth© Unit • Built-In High Precision GPS Antenna • 1200/9600bps APRS Data Communications • Supports Simultaneous C4FM Digital • Micro SD Card Slot

FT-65R | *144/430 MHz Transceiver*

Compact Commercial Grade Rugged Design • Large Front Speaker Delivers 1W of Powerful Clear Audio • 5 Watts of Reliable RF Power Within a compact Body • 3.5-Hour Rapid Charger Included • Large White LED Flashlight, Alarm and Quick Home Channel Access

FTM-6000R | *50W VHF/UHF Mobile Transceiver*

• All New User Operating Interface-E20-III (Easy to Operate-III) • Robust Speaker Delivers 3W of Clear, Crisp Receive Audio • Detachable Front Panel Can Be Mounted in Multiple Positions • Supports Optional Bluetooth® Wireless Operation Using the SSM-BT10 or a Commercially Available Bluetooth® Headset

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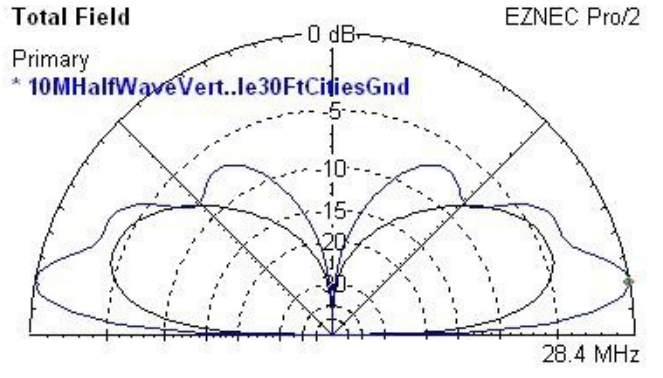
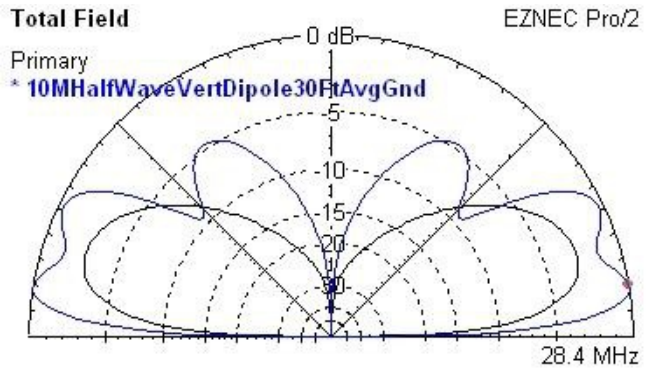
Contact HRO for promotion details. Toll-free including Hawaii, Alaska and Canada. All HRO 800-lines can assist you. If the first line you call is busy, you may call another. Prices, specifications and descriptions subject to change without notice.

Figures for K9YC Antenna Article



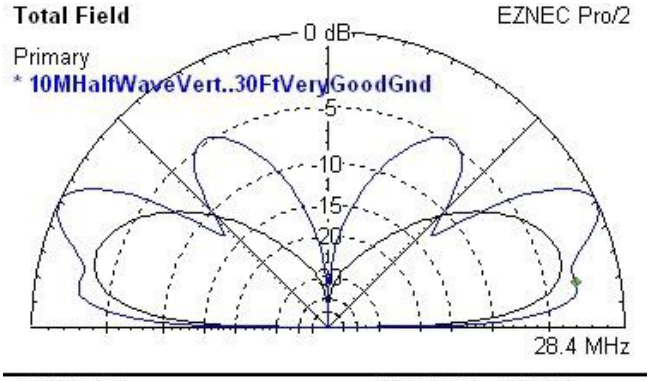
Elevation Plot
Azimuth Angle 0.0 deg.
Outer Ring 4.31 dBi
Cursor Elev 10.0 deg.
Gain 4.31 dBi
0.0 dBmax
6.59 dBPrTrc

Fig 15



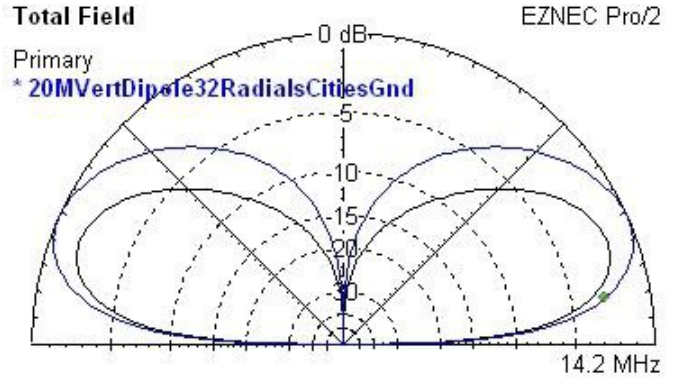
Elevation Plot
Azimuth Angle 0.0 deg.
Outer Ring 3.04 dBi
Cursor Elev 10.0 deg.
Gain 3.04 dBi
0.0 dBmax
4.15 dBPrTrc

Fig 16



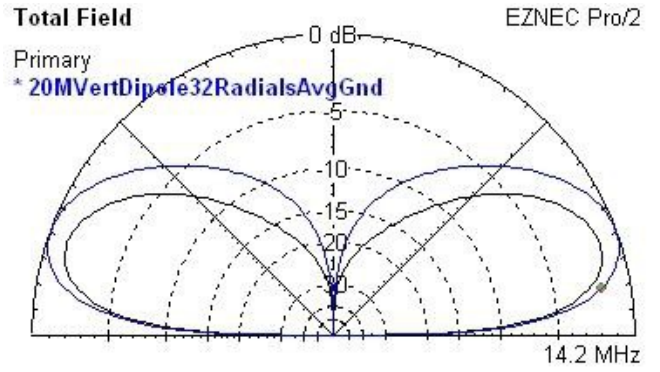
Elevation Plot
Azimuth Angle 0.0 deg.
Outer Ring 4.03 dBi
Cursor Elev 10.0 deg.
Gain 1.24 dBi
-2.79 dBmax
1.66 dBPrTrc

Fig 17



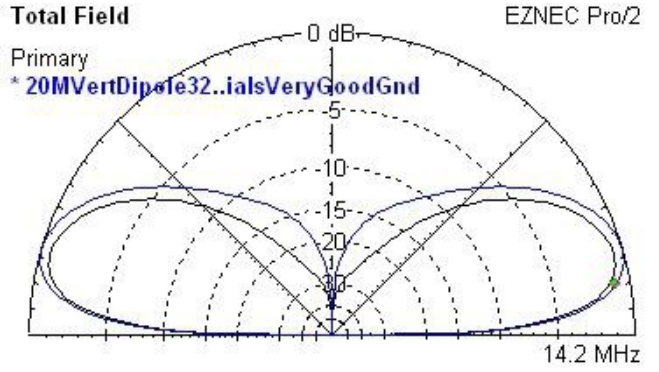
Elevation Plot
Azimuth Angle 0.0 deg.
Outer Ring 1.39 dBi
Cursor Elev 10.0 deg.
Gain -1.35 dBi
-2.74 dBmax
1.16 dBPrTrc

Fig 18



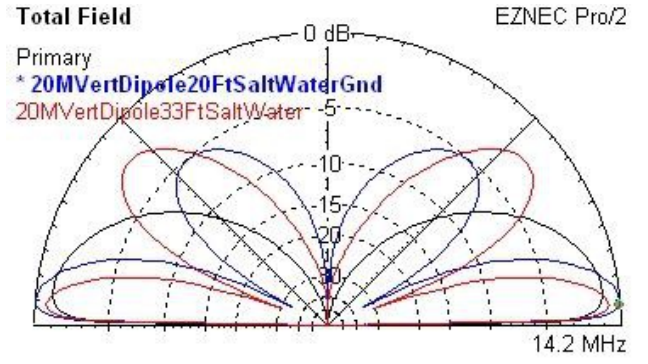
Elevation Plot		Cursor Elev	10.0 deg.
Azimuth Angle	0.0 deg.	Gain	-0.42 dBi
Outer Ring	1.32 dBi		-1.73 dBmax
			0.92 dBPrTrc

Fig 19



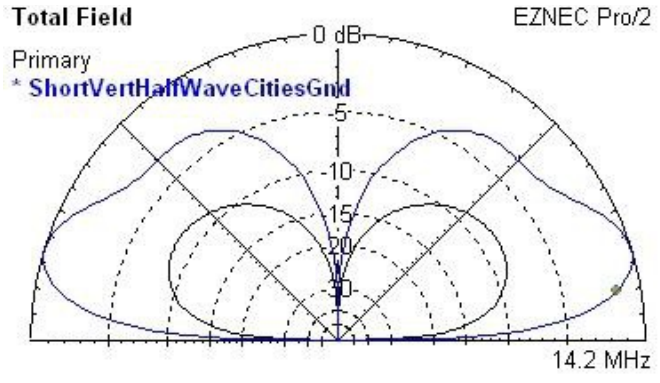
Elevation Plot		Cursor Elev	10.0 deg.
Azimuth Angle	0.0 deg.	Gain	0.76 dBi
Outer Ring	1.6 dBi		-0.84 dBmax
			0.48 dBPrTrc

Fig 20



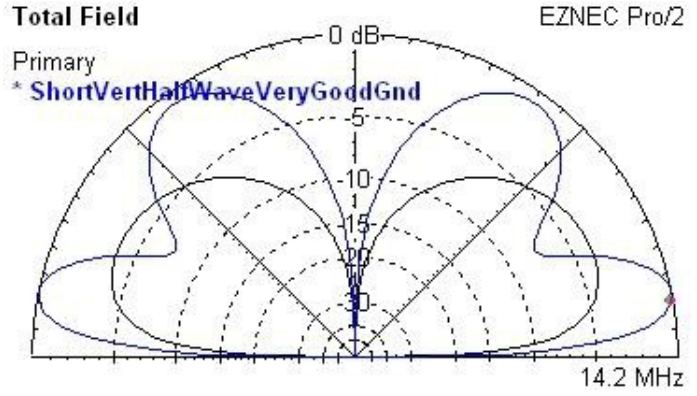
Elevation Plot		Cursor Elev	4.0 deg.
Azimuth Angle	0.0 deg.	Gain	6.75 dBi
Outer Ring	6.82 dBi		-0.06 dBmax
			1.24 dBPrTrc

Fig 21



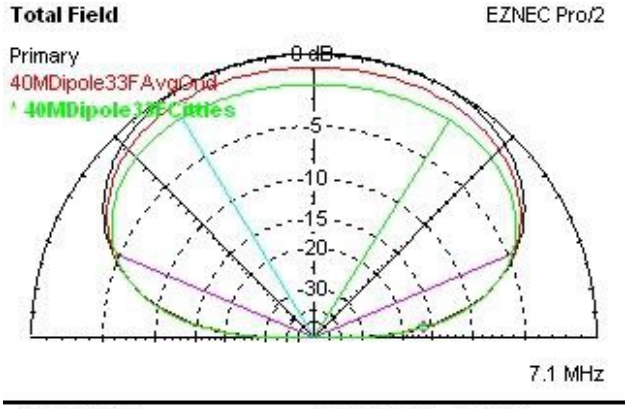
Elevation Plot		Cursor Elev	10.0 deg.
Azimuth Angle	0.0 deg.	Gain	0.03 dBi
Outer Ring	1.42 dBi		-1.39 dBmax
			11.01 dBPrTrc

Fig 22



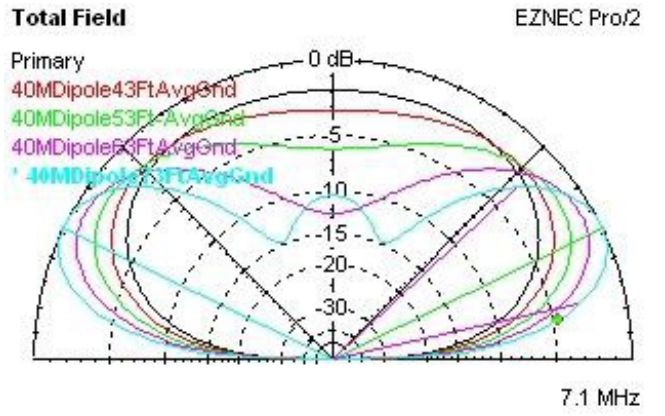
Elevation Plot		Cursor Elev	10.0 deg.
Azimuth Angle	0.0 deg.	Gain	0.43 dBi
Outer Ring	0.52 dBi		-0.09 dBmax
			5.53 dBPrTrc

Fig 23



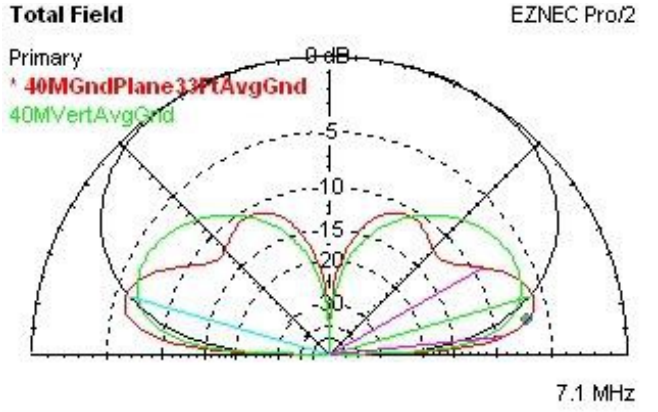
Elevation Plot		Cursor Elev	5.0 deg.
Azimuth Angle	0.0 deg.	Gain	-9.23 dBi
Outer Ring	6.82 dBi		-14.26 dBmax
			0.6 dBPrTrc

Fig 24



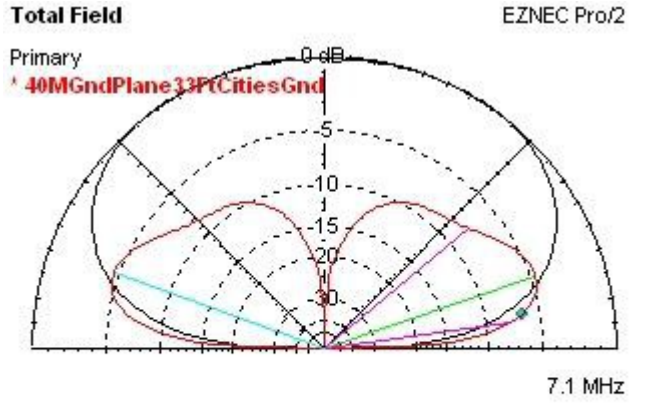
Elevation Plot		Cursor Elev	10.0 deg.
Azimuth Angle	0.0 deg.	Gain	3.28 dBi
Outer Ring	7.85 dBi		-4.56 dBmax
			7.17 dBPrTrc

Fig 25



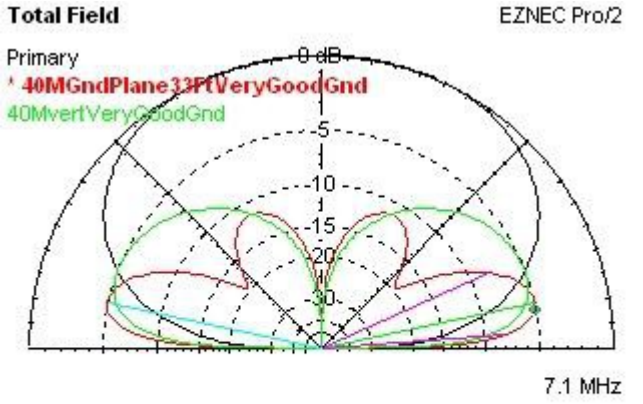
Elevation Plot		Cursor Elev	10.0 deg.
Azimuth Angle	0.0 deg.	Gain	-0.74 dBi
Outer Ring	6.02 dBi		-0.81 dBmax
			3.15 dBPrTrc

Fig 26



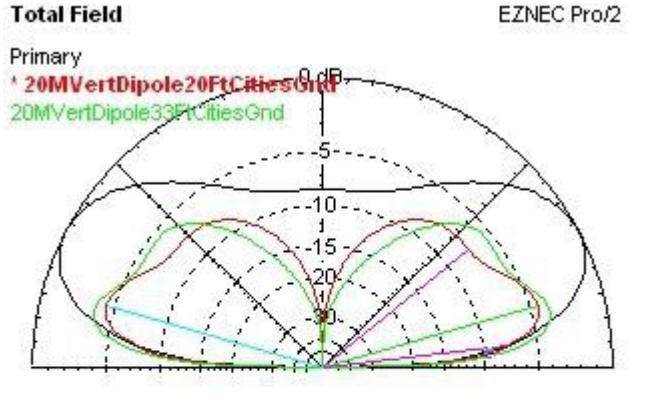
Elevation Plot		Cursor Elev	10.0 deg.
Azimuth Angle	0.0 deg.	Gain	-1.43 dBi
Outer Ring	5.03 dBi		-1.79 dBmax
			2.23 dBPrTrc

Fig 27



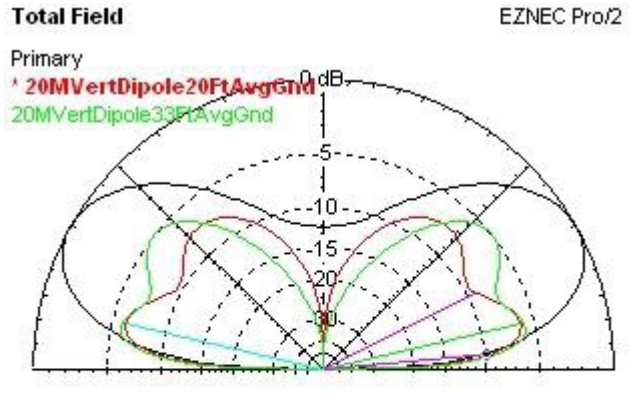
Elevation Plot		Cursor Elev	10.0 deg.
Azimuth Angle	0.0 deg.	Gain	1.66 dBi
Outer Ring	6.82 dBi		-0.15 dBmax
			5.65 dBPrTrc

Fig 28



Elevation Plot		Cursor Elev	5.0 deg.
Azimuth Angle	0.0 deg.	Gain	-2.93 dBi
Outer Ring	6.37 dBi		-4.85 dBmax
			0.75 dBPrTrc

Fig 29



Elevation Plot		Cursor Elev	5.0 deg.
Azimuth Angle	0.0 deg.	Gain	-2.51 dBi
Outer Ring	7.11 dBi		-3.48 dBmax
			1.12 dBPrTrc

Fig 30

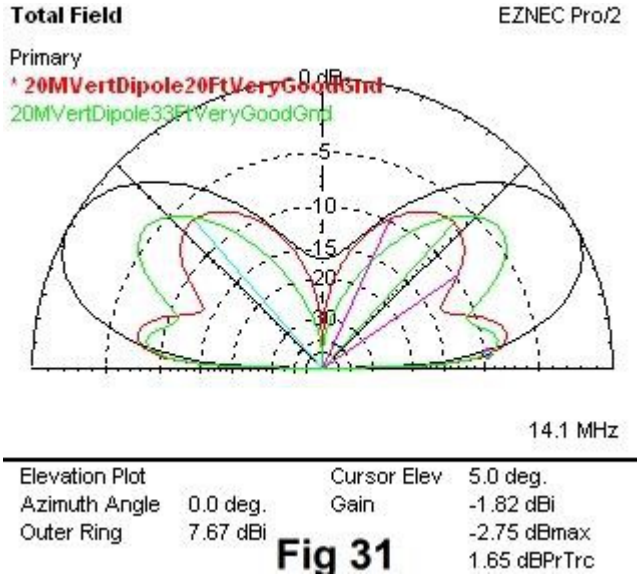

Total Field
EZNEC Pro/2
Primary
' 20MVertDipole20FtVeryGoodGrd
20MVertDipole33FtVeryGoodGrd
0 dBi
5
10
15
20
30
14.1 MHz
Elevation Plot
Azimuth Angle 0.0 deg.
Outer Ring 7.67 dBi
Cursor Elev 5.0 deg.
Gain -1.82 dBi
-2.75 dBmax
1.65 dBPrTrc

Fig 31