THE NEWSLETTER OF
THE KINGS COUNTY RADIO CLUB

KCRC

November 2022 "NULLUM BENEFICIUM IMPUNITUM" Volume 9, Issue 11

Minutes of the November 2nd 2022 KCRC Meeting

Our November "Pre-Meeting Question and Answer Session" ran without any problems.

The monthly meeting was called to order at 8:08 PM, by our President Mitch N2RGA. Also present at tonight's meeting were Vice President Berlotte KD2MYF, Secretary Roy AC2GS, Treasurer Frank KD2QPU, Executive-At-Large Joe N2DEJ, Bob KD2NVB, Ralph KD4RN, Lloyd K2JVX, Howard N2GOT, Max KD2VEA, Richard KA2KDQ, William AC2ZV, and Andrew AK4GU.

The vote to accept the minutes of the July, and August September and October meetings were passed unanimously.

Treasurer Report—Frank KD2QPU reported that our Treasury currently has $1,306.51 in our bank account as well as $381.43 in our PayPal account for a total of $1,687.94 in assets.

Repeater status was discussed by Mitch N2RGA - There has been no further work on the Repeater, in the past month. Mitch plans to arrange a meeting with those interested in making up a new Repeater Committee.

2 Meter Net Report—Joe N2DEJ reported that the Net has good participation, but could use more participants by Club members..

10 Meter Report—Roy AC2GS reported that the 10 Meter Net continues to be poorly attended by Club members, and could use more Club member's participation.

KCRC TechNet—Roy AC2GS reported that the TechNet is alive and well, but suffers , as well, from a dearth of Club member participation, so please try to join us on the second and fourth Wednesdays of every month!

Fusion Net Report—No NCOs were present at the meeting, so this was tabled.

ARES Report—William reported about the annual Thanksgiving Day Turkey Trot, on Thursday November 24th, at 8 AM. If you are interested in volunteering, contact Simon at QSO.K2FH@gmail.com. On Dec. 7 Community Mayors will be having the Op Santa event at JFK. If you want to attend you must sign up for it by going to https://forms.gle/w8BDsBXpSqBXu3tX6 . If you do sign up, or have already done so, please reach out to Dave, KA2KAB at kb2kab@aol.com to let him know.

Old Business: There has been no change, regarding the status of our bi-monthly VE Sessions.

We have 74 members on our Roster. We had no new members this past month. We are still selling Club patches at $5 a piece and $1 shipping and handling. You can save the shipping and handling fee by buying them at our monthly in-person meetings (when they are re-established).

The search for a viable location for our Club's functions (General Meeting and VE Sessions) was discussed.

There were hopes that our old meeting place might be available after the Ne Year. The meeting place of the dissolved KCRA offered the meeting place for December, but they plan on renovating that room in 2023, making its availability in the future dubious.

Berlotte KD2MYF discussed the 2022 KCRC Picnic,. We had a very small turn out (two Club members), but were joined by some guests.

We discussed when the 2023 Dues drive. Mitch N2RGA reset the webpage on our site, regarding paying dues, from the previous pro-rated 6 month membership, back to the annual membership price. All new members paying after November 2, 2022 will have the remaining days of 2022 included in their 2023 membership. Our next club mailing will include a request for all present members, not yet paid up for 2023, to please renew their dues!

We held nominations for 2023 Executive Board Offices: President Max KD2VEA, Vice-President Berlotte KD2MYF, Secretary Roy AC2GS, Treasurer Frank KD2QPU, Executives-At-Large Joe N2DEJ and Mitch N2RGA. The General Membership will accept any further nominations up until our election during our December General meeting.

New Business:

There was no new business.

The meeting was closed 8:38 PM.

Stay Safe Everyone!

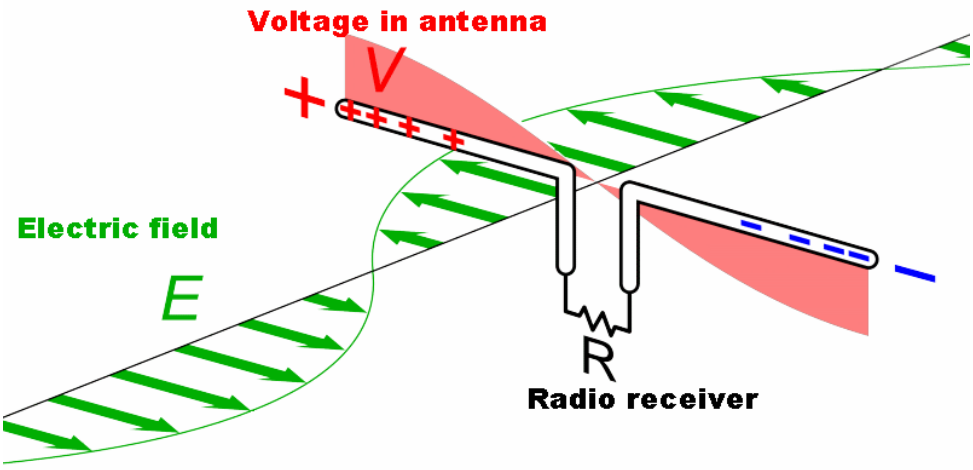
Berlotte KD2MYF and William AC2ZV at the 2022 KCRC Picnic

I Don’t Need No Stinkin’ Balun…

Or Do I?

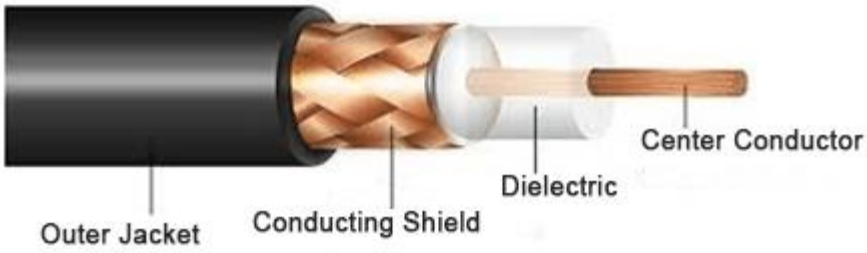
(Part of the “Fun with Antenna Simulator Series)

Well, let’s start again with one of the simplest antennas that exists, the ‘simple’ resonant center fed dipole:



The new Ham’s first home antenna might be the simple center fed dipole, and the question that inevitably comes up is: should I use a 1:1 balun, or some RF choke for this antenna?

Well, your dipole is a balanced antenna (there is a decidedly symmetrical aspect to its design – one leg mirrors the other leg of the dipole), and your transmission line is most likely going to be a coaxial cable:



Which is unbalanced (no mirror image symmetry going on with this kind of transmission line).

So, a balanced-to-unbalanced BALUN would seem to be in order, or in other terms a Common Mode Current choke.

But what's common mode currents?

Well, your coaxial cable is capable of providing a current path to TWO different currents. You may think that your coaxial cable has two conductors, and you can only handle one current in it, and that is the case for Direct Current (DC) use, but you are using it for Radio Frequency, Alternating Current (AC) use, and in that case, there are THREE conductors:

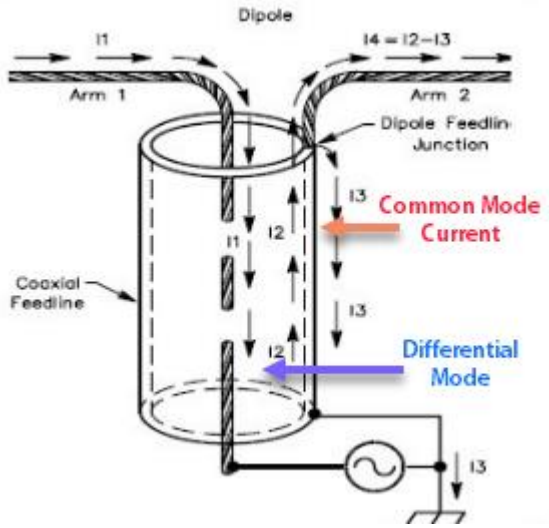
The center wire supplies differential mode current.

The inner surface of the braid shield supplies the opposing differential mode current.

And the outer surface of the braid shield supplies common mode current reflected from your feed point.

The two differential mode currents are able to cancel each other out in free space and prevent it from being radiated away as radio waves. That is why coaxial cable offers such great isolation (often estimated as being 100 dB – that means that only 1/10,000,000,000 of the signal leaks out of it), when used correctly!

The outer surface of the braided shield is operating in common mode, its current is not out of phase with the current running on the inner aspect of the shielded braid – it is flowing in the same, common phase. Without that opposing differential phase, your common mode current on the outer surface of your braided shield is free to radiate away! Radiate outside AND inside your shack.



Radiating outside your shack might be advantageous at some times, and some antenna designs utilize this transmission line RF radiation for different purposes, but for our simple dipole, we would like our RF to radiate out from our dipole and certainly not inside our shack, rebooting our computer, or triggering our garage your opener…

So, do you REALLY need that 1:1 balun/common mode choke? Well, you may get away without one, if you're lucky…

Do you feel lucky, punk <grin>?

(Sorry, I just couldn't stop myself from using that line – check out 'Magnum Force, though – it was a great film.)

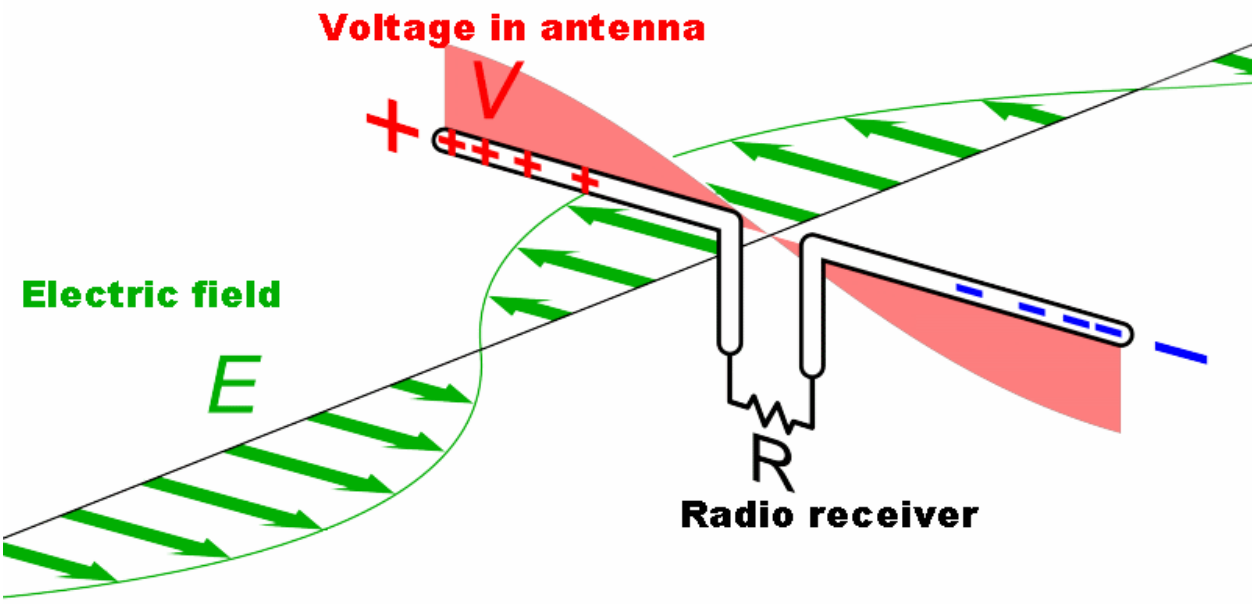
Well, let's not plummet down some technical 'rabbit hole' right now, this article is part of a series where I use antenna simulations to get most of my points across.

How The Heck Do End-Feds Work? - The End Fed Half Wave

(Part of the "Fun with Antenna Simulator Series)

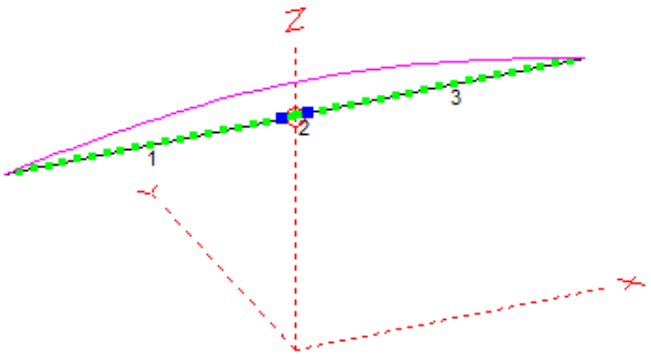
This time around, let's take a look at End-Fed Half Wave wire antennas.

Let's start with our old favorite, once again, the center fed resonant dipole:



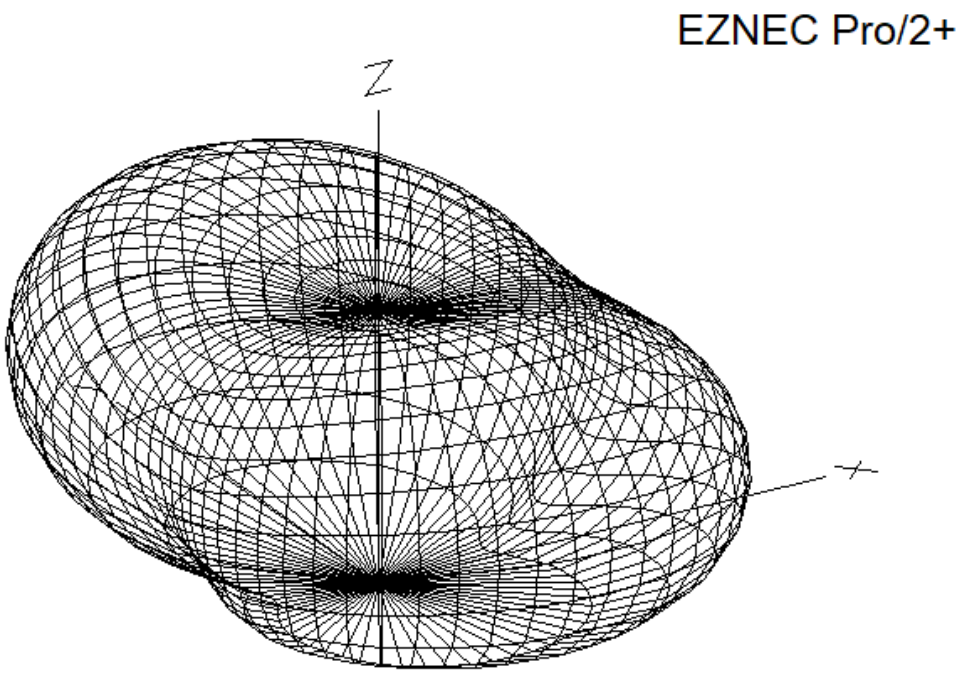
We'll model it into EZNEC and see what we see…

Here's what the RF currents look like on an antenna like that:

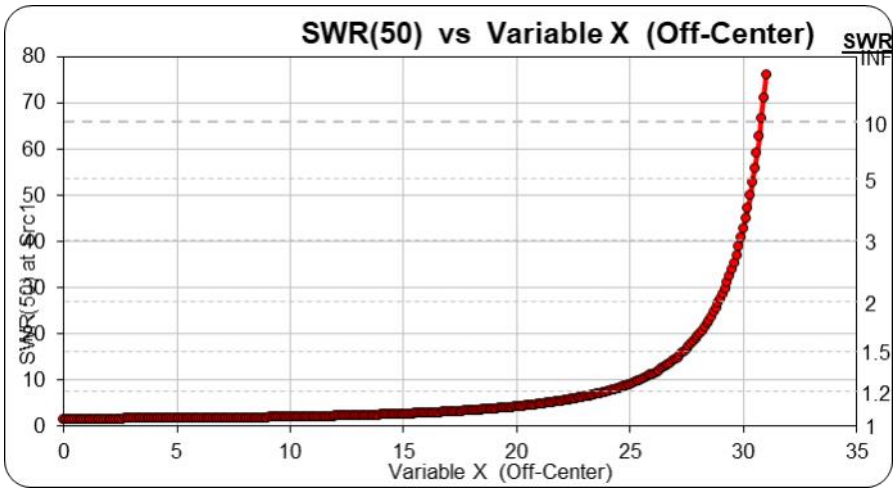


In a resonant center fed dipole, the current is highest at the center, where the feed point is located (the voltage peaks, which are not shown) occur at the end of each dipole leg.

The resonant center fed dipole's radiation pattern, is probably something that you have seen before:



Well, most of you have seen all this before, but let's tinker some more with this kind of antenna. What happens to the impedance as we slide the feed point from the center, closer and closer to one edge of the antenna???



The 'Y' axis isn't in ohms of impedance, but in SWR, where 1:1 is 50 ohms Impedance. The 'X" axis shows how far off center the feed line is attached. At 33 feet, the feed line is attached to the end of this 40 Meter half wave dipole.

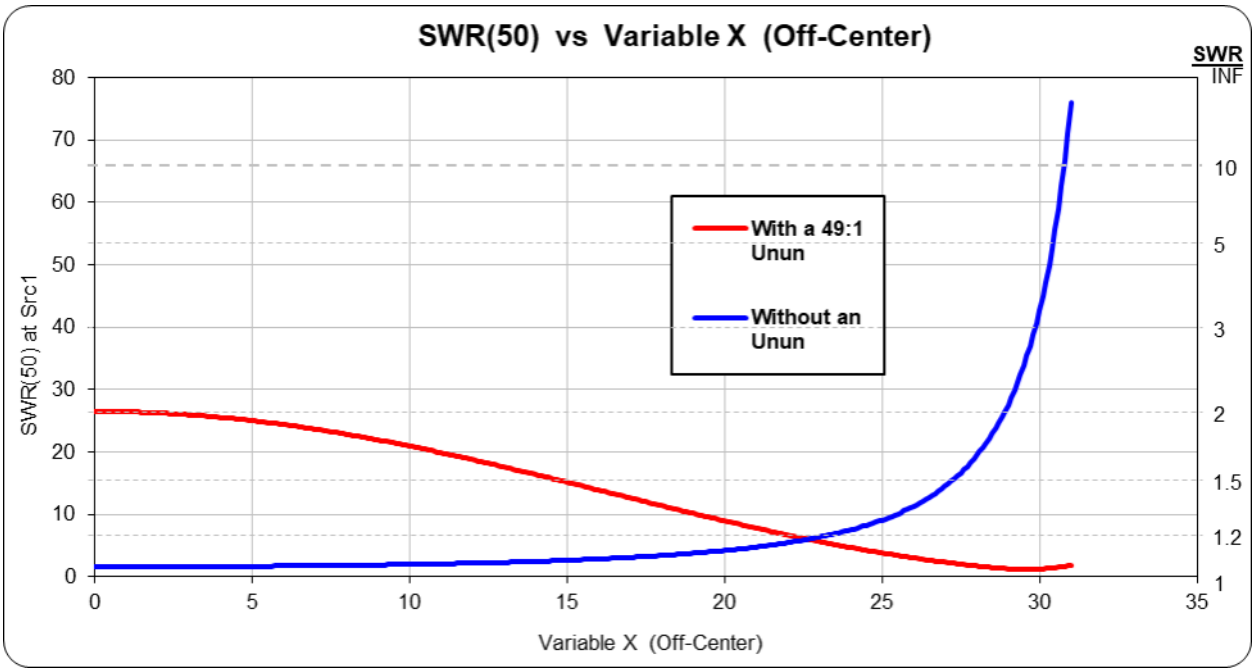
You might notice that if we were able to attach a feed line to the very edge of the end fed wire, even a 64:1 unbalanced-to-unbalanced transformer would be **insufficient.** In fact, when we talk about End Fed Half Wave Antennas, it would be much more precise to call them Extremely Off-Center Half Wave Antennas! Nevertheless, these are still called End Fed Half Wave Antennas, and so we shall do the same, here.

Now, if we want to work with this antenna with its feed line very near the edge, we are going to have to deal with the fact that our antenna's input impedance is not anywhere hear 50 ohms, and I doubt that there is a normal antenna tuner that could completely handle it!

We could be clever about it and place a quarter-wave shorted open line transmission line, that could act as a transmission line transformer for the antenna's input impedance, to transform 2 or 3 thousand ohms to something close to 50 ohms, that we can work with, and that would be an End Fed Zepp, made famous as the antenna of choice aboard Zeppelins. But we'll leave that for maybe another article, some other day. These days you see less obvious Zepp antennas that go by such names as J Poles and Cushcraft R series antennas, but they are just variations of the old Zepp antennas of the past.

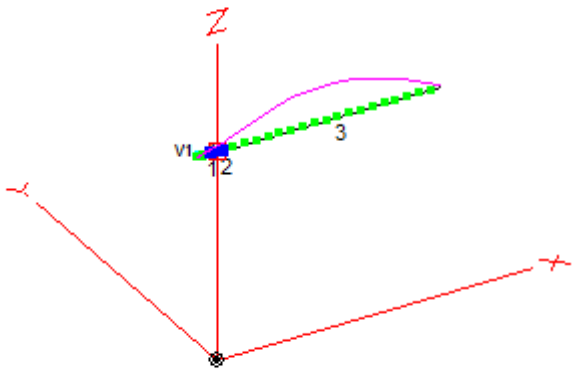
Today, we will consider inserting a 49:1 unun (Unbalanced-to-Unbalanced), although some use a 64:1 unun with good results. These ununs use a toroid with 2:14 transformer windings, or 2+12 autotransformer windings in order to accomplish their 49:1 impedance transformation.

We will add that 49:1 balun into the antenna simulation and see if it has an effect upon our simulated antenna!



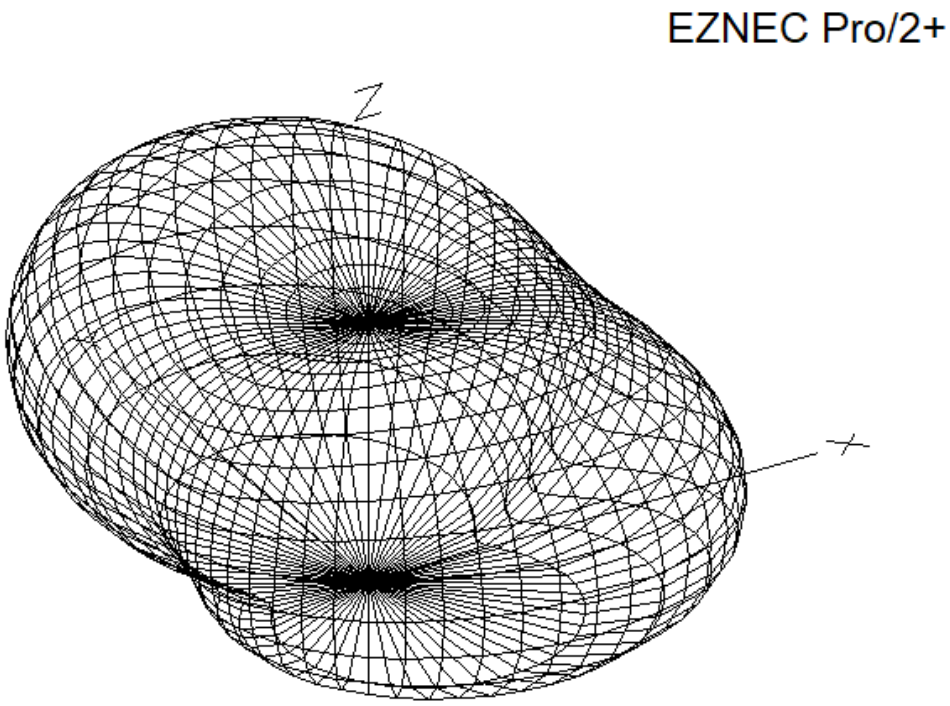
With that 49:1 Unun in place we seem to have a near 1:1 SWR very close to the end of the half wave wire. An End Fed Half Wave (EFHW) Antenna!

Let's see what the antenna current looks like:



Well, that looks just like the current distribution, when the feed line was in the center!

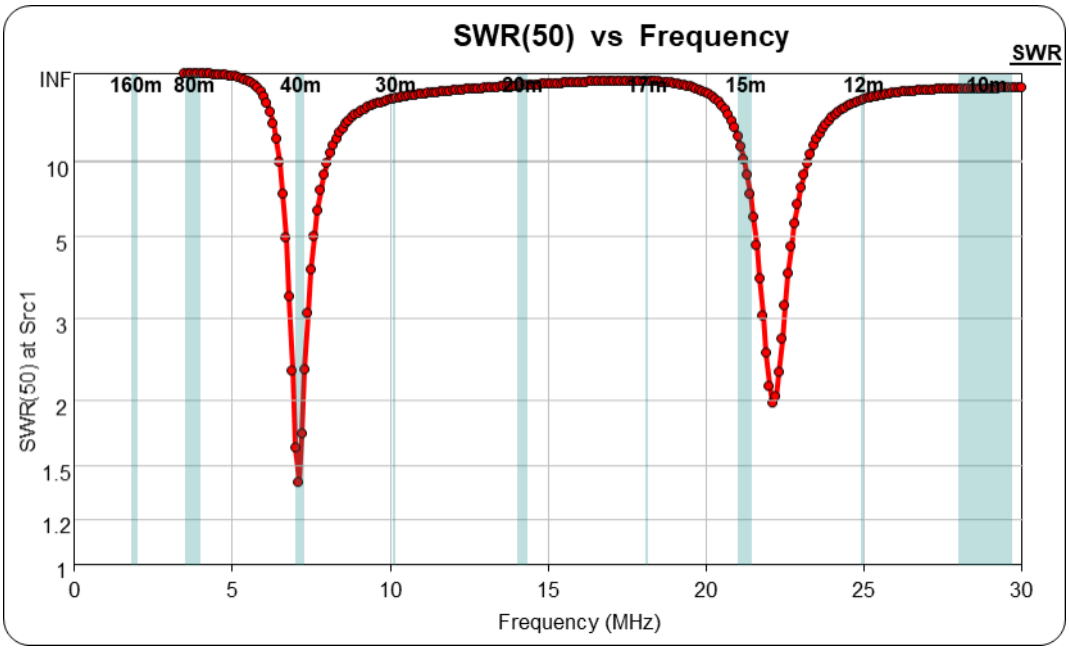
What about the radiation pattern?



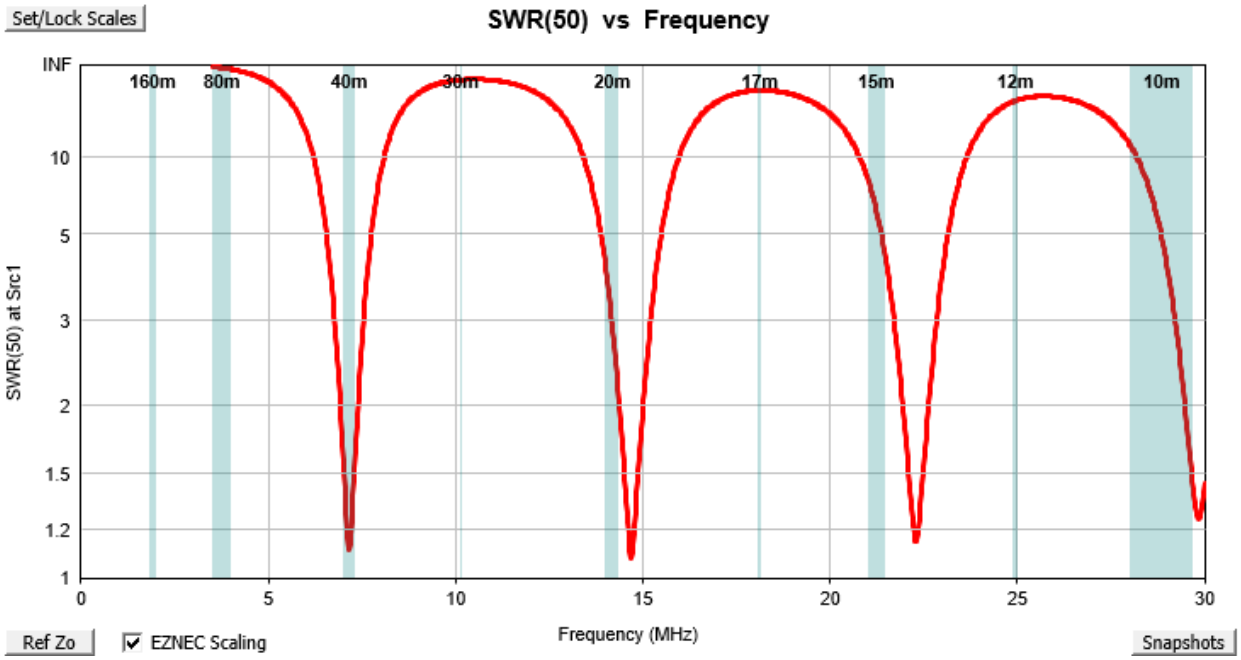
That looks the same as the center fed antenna simulation.

So, it all looks very similar. Is there anything special about an end fed half wave that might make it a better choice rather than the good old center fed dipole?

Remember what the SWR sweep across the Ham Bands looked like for a simple 40 Meter center fed dipole?



Well. Let's take a look at the SWR vs frequency sweep across the amateur bands for this End Fed Half Wave Antenna:



Gee… That's interesting. You have your resonance at 40 Meters, like your center fed dipole, and you ***almost*** have resonance on the 20M, 15M and 10M bands!

But we were told that antennas work on the odd harmonics. We saw how our 40 Meter center fed dipole ***almost*** was resonant on the 15 Meter band. Now, this End Fed Half Wave seems to ***almost*** be resonant on the even and odd harmonics – but it's not resonant, just ***almost*** resonant, and ***almost*** ain't good enough!? What's the problem?

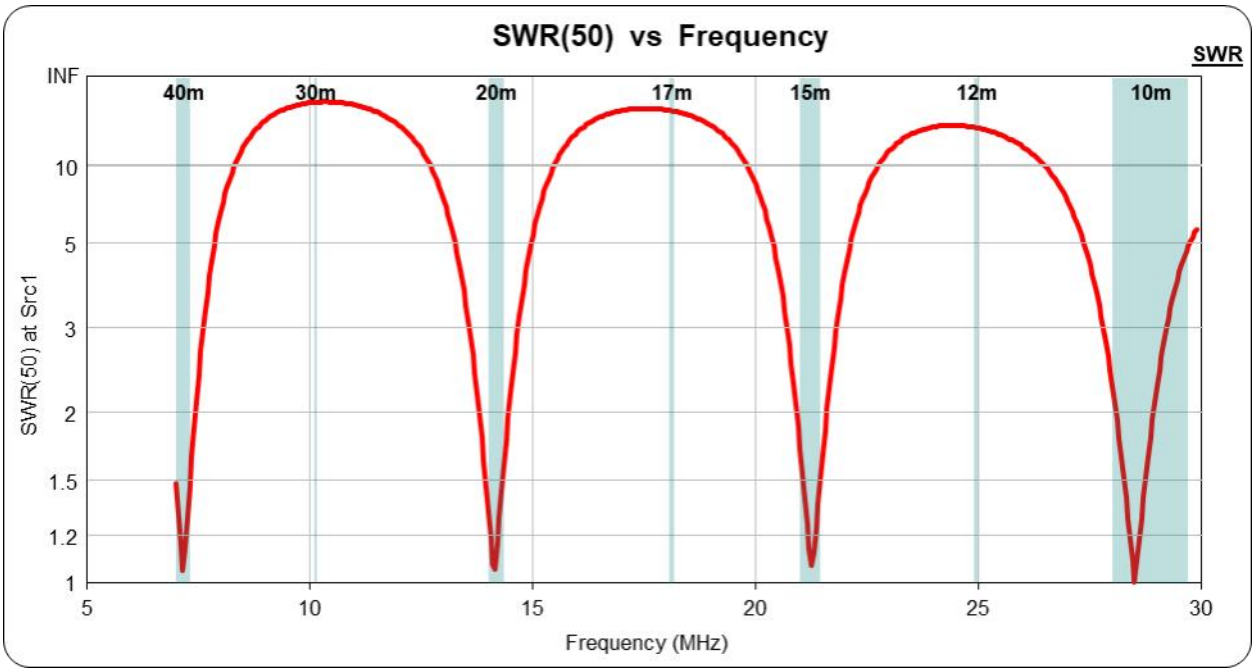
Well, it is something called "The End Effect". The end of each wire has an additional capacitance for the antenna – it is like you have a teeny-tiny capacitive hat at the ends. Effectively it electrically lengthens the wire. That is why a half wave dipole is physically a little shorter than a true half wave – the "End Effect" requires the dipoles to be just a bit mechanically short, in order to be electrically resonant.

This End Effect is less pronounced for the further harmonics and the second and third and fourth, etc. harmonics see the antenna element as too electrically short to be perfectly resonant!

So, is the End Fed Half Wave a failed experiment? If so, why the heck does it seem so popular these days?

Well, there happens to be a 'fix' for this little flaw. In most commercial EFHW antennas you may notice a small coil of wire built into the middle of the antenna. If you do it just right, you electrically lengthen the wire more and more as you go from the second harmonic, to the third harmonic and then the fourth harmonic! This will allow you to use your antenna on a lot of the Ham Band. Some people go another route and insert something like a 200pF capacitor in series, shorted with a 33,000-ohm resistor, in parallel. to drain away any high voltage potentials from triboelectricity. This method will effectively electrically shorten the first harmonic. The second harmonic will be less electrically shortened, and the third harmonic will be even less electrically shortened, and the fourth will be even less electrically shortened. You can either electrical stretch the left side, or electrically shrink the right side, but in the end, if you do things right,

you end up with an SWR sweep that looks something like this:

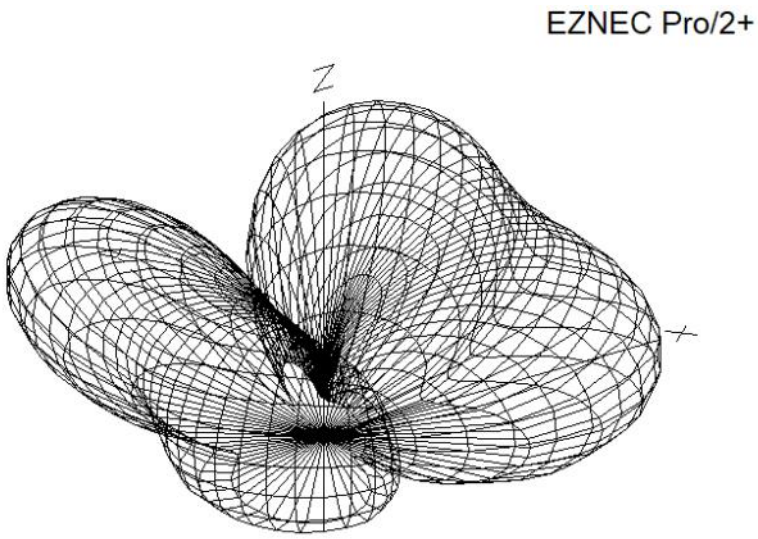


Now, that looks nice, doesn't it?

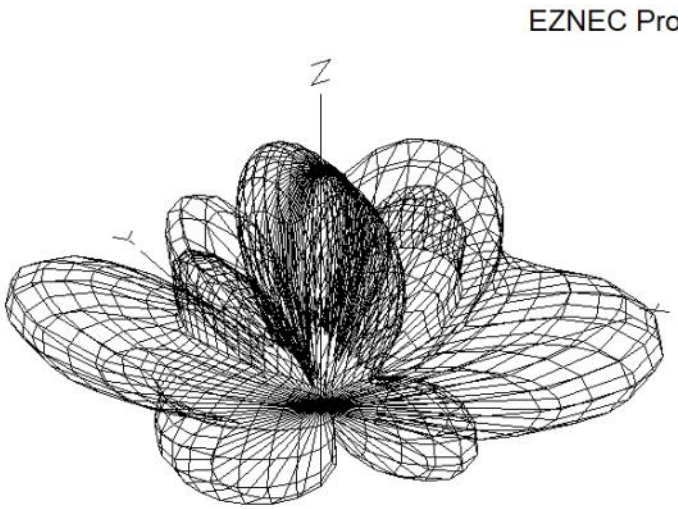
So, is the End Fed Half Wave "The Perfect Antenna"? Of course not. That 49:1 Unun is not a loss-less magical device. There are better designs and worse designs of 49:1 Ununs. They can be lossy and inefficient, and they are not strictly 49:1 impedance transformers throughout the bands that you would like to use them on. EFHW antennas are considered 'Voltage Fed" antennas, and those voltages can be as high as 1 to 5 kilovolts, so don't let any civilians near those feed lines when you are using that antenna!

And what about the radiation pattern of these antennas? At its 1st harmonic it has a similar radiation pattern as its center fed version, as seen earlier in this article.

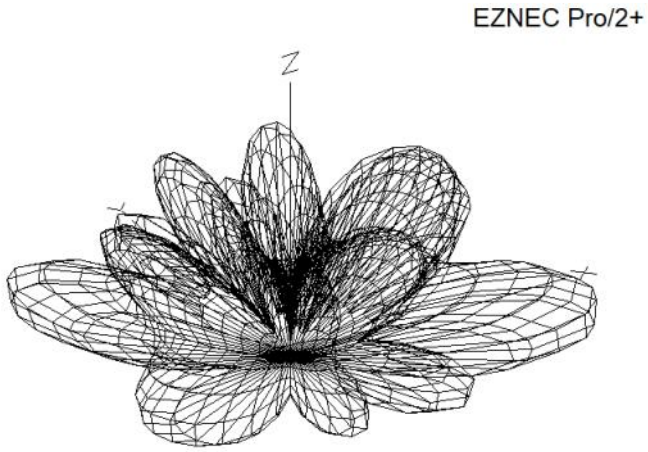
But what about its second harmonic (14.15 MHz):



Or its third harmonics (21.250 MHz):



Or its fourth harmonic (28.350 MHz):



So, as you may have noticed, the radiation pattern tends to get complicated, and less than optimal.

After all, nothing is perfect.

So, that's the End Fed Half Wave Antenna. Hopefully this might offer a better sense of how the darn thing actually works.

73,

Roy AC2GS

My thanks to Mike WA7ARK for the EZNEC file and his excellent YouTube video (https://youtu.be/iMbN_uDeyU0) that was the inspiration for this article.)