THE WEST RAND AMATEUR RADIO CLUB

May 2008
Volume 8, Issue 10

ANODE

Inside this issue:

Special points of interest:

- The club's AGM is on the 5th of July at 12:00.
- Contact details on back page (updated)

Editor's Comments

Volume 8 Issue 10
June 2008

The AGM is in July

Yes, the AGM will be happening soon. Please pay subs as soon as possible (Its still R75), so you can vote the new committee in as a "member in good standing". [See the special points below]

In this issue

We have an interesting article containing advice on removal of enamel from wire. Thanks to Ron for the local aspect information.

The other article is about antenna basics. Something that most amateurs forget when trying out a so called new antenna!

Always something new in the world of electronics

It seems that a week does not go by without a new chip or Integrated Circuit being released. A week or so ago, I was telling the guys at the club about a direct conversion chip for use up to the GHz region. This week I see a power line communication chip being launched. How come I get to hear about all these exciting develop-

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HOW TO: Removing enamel coating from wire

Subject: Re: REMOVING ENAMEL COATING
From: AF6AY <LenAnderson@ieee.org>
Date: Fri, 30 May 2008 11:09:54 -0700 (PDT)
Newsgroups: rec.radio.amateur.homebrew

From: Michael Coslo on Thurs, May 29 2008 6:02 am:

AF6AY wrote:
From: dplatt@radagast.org (Dave Platt) wrote on Mon, May 26 2008:

I wonder if items such as Strip-X became obsolete due to changes in insulation composition, i.e. not working on new types of insulation. But I do agree about the folk who would protect us from ourselves. Strip-X was pretty innocuous stuff.

As far as I could tell from communications with General Cement, it was FEDERAL REGULATIONS that was the issue. GC already had over a hundred products in its catalogue so they weren't going to suffer any real loss in income. They've been making 'radio' chemical products for over 75 years.

Did you by any chance try some old style enamelled wire in your experiment above?

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Removing enamel coating from wire

(continued from page 1)

"Experiment?" The only experimentation I did was well AFTER my last bottle of Strip-X was used up, residue dried out. Strip-X from GC worked for me the first time I tried it long, long ago. That experimentation I wrote about was to find a possible substitute for GC Strip-X.

GC Strip-X has worked on enamel-coated magnet wire, PolythermalEze (a trade name), different kinds of wire-wrap wire. It didn't work on the surplus Teflon-coated #25 AWG magnet wire I got surplus from a transformer maker (#25 is an odd gauge, heh heh, but the transformer makers use practically every gauge in the AWG table). Tetrafluouroethylene is pretty inert stuff so few chemicals will affect it. Teflon also abrades easily compared to other insulations so it is relatively easy to strip with a knife.

The acetone issue is a strange one. Acetone is one of the safer solvents out there, heck our body even produces some acetone.

I think that should be 'acetyls' in the human body, not acetone per se. <shrug>

Acetone won't strip off enamels or other polymers used on magnet wire. I tried that, too, also toluene.

Acetone as a solvent was dropped from the model hobby industry chemicals once gas-powered models started using "hot fuel," the methanol-based stuff for glow plug engines that took over from real spark plug ignition model gas engines in the late 1940s.

Methanol softened acetate-based paints, whereas the 'ordinary' gasoline used in spark ignition engine fuel did not affect acetone-solvent lacquer commonly called "dope" in model hobby industry jargon. For years Testor Chemical Company, also in Rockford, IL, had lacquer paint bottle labels of DOPE in all-capitals, something you just CANNOT DO in today's restrictive society. Building model airplanes was fun, the "dope" smelled very nice, so the blue-noses made all kinds of bad noises about the "evils" of having fun in a hobby. Sigh.

Digression: The first small two-cycle gasoline engines used real spark plugs of very small size. I still have two Champion brand spark plugs in a storage area...less than a half-inch long...and those are for the big class C and D engine displacements. I learned to solder wires properly by making the spark ignition packages for gas-powered models. The "spark coil" for those was a tiny one that was picked up by the first electronic flash units for camera use in the 1950s...ideal for igniting the Xenon flash tubes that replaced the one-shot photoflash bulbs.

Yes, I was emitting "spark" RF in the late 1940s with those spark-ignition engines, all without being licensed to do so.

So were other gas-engine modellers and just about EVERY running automobile of that time! :-)

My late father-in-law was a polymer chemist. He died in 1977 so can't help me. I just hope that some chemist could come to the aid of us hobbyists using coated magnet wire and provide us with a GOOD product like Strip-X was. Meanwhile, it's back to being VERY careful with a sharp X-Acto knife and scraping coatings. With #34 AWG that requires Zen-like calmness...

That is an understatement 8^) I have to make sure I am in a good mood, and no coffee for me that day before I attempt that sort of thing.

Coffee calms me down. Always has. Makes for good moods. :-)

Actually, I use a fine emery finishing paper to strip fine gauges of enamel-coated wire. I've used X-Acto hobby knives for the heavier gauges. Emery paper (easy to get at do-it-yourself stores) allows a gentle stroking of a

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Removing enamel coating from wire

(Continued from page 2)

folded emery paper over the wire. I find it works better to draw the emery paper over the wire rather than pulling the wire through the paper. Less nicking than with a knife blade for #28 to #34. I just finished a few small toroid inductors using #34 enamel-covered last week. Not recommended for beginners. :-)

PATIENCE (in all-caps) is needed to make toroids of the T37 size (about 3/8" OD), drawing a very-carefully-folded wire bundle through the centre hole in a toroid core. :-) THAT is the "Zen" thing. Good self-control is absolutely necessary, can't use slap-dash hurry-up behaviour.

By the way, don't use "Q-Dope" for coating finished inductors, any type. Despite what the ads say, it does NOT enhance the coil's Q. Trials of before-after measurements on a Q-Meter haven't shown goodness. ALL coatings degrade inductor Q. I've found that oil-based 'maritime' clear varnish to result in less degradation of Q than other coatings. I've used McCloskey "Gym-Seal" brand with good success on making inductor coatings that adhere to windings for years. It is available nationally in do-it-yourself stores.

Q-Dope (originally acetate-solvent based, now probably using toluene solvent) will "lift" from smooth surfaces within a year in climates with only moderate humidity. Q-Dope only adheres well to all-polymer-based surfaces, won't get into fine pores. 'Maritime' varnishes NOT polyurethane based DO grab porous surfaces. I've tried various polyurethane-based varnishes with mixed results; the makers of those apparently have a rather large variation of ingredients.

Varnishes take 2, 3 days to properly cure if used on coils.

That's the down-side of using the stuff in hobby applications. However, on a Q-Meter the characteristics of 'maritime' varnish coated inductors don't change much after it has reached a tacky state, roughly 12 hours after application.

It ain't for 'weekender' projects started on a Saturday and 'finished' on Sunday.

73, Len AF6AY

{—-}

I asked Ron for comments on this and he was kind enough to reply with some relevant details for us in South Africa.

Ron's Reply

Ok John,

"Normal" wire coatings that are available in the industry here are primarily of the Class 200, 2 coat system. Ie first 3 to 6 layers of a polyamide varnish, the outer 2 to 6 coats of a polyimide varnish.

Most conductor sold is of the Grade 2 type. (refers to the covering thickness). You can find Class 180, polyamide covered if you are lucky but it is not main stream.

There is some polyurethane coated wire available, mostly VERY THIN that is used in telecom type relay coils (0.05 mm). This can be soldered directly without cleaning.

As far as removing the coating goes, good luck! Most winders don't bother, they just braze the connections directly using "Silphos" as the filler.

For wire of about 1 mm up you can scrape or sand the coating off with a piece of 400 or finer water paper, not very pleasant but it works, unfortunately you can also damage the wire.

The easiest approach is to heat the end to red heat in a propane flame and immediately quench it in a small container of methylated spirits.

This works well on the smaller sizes, just take

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Removing enamel coating from wire

care not to melt the wire! Practice on a scrap or two before attempting it on your just completed 1000 turn special.

As far as Strip-X is concerned, if you have some - LOOSE it. The stuff is based on HF (Hydrofluoric acid) and is not "pretty innocuous", HF is a lover of the calcium in your skeleton and will cause some nasty damage.

If you are capable of working with unfriendly chemicals, you can make up some Piranha Solvent that does dissolve wire enamels, copper - - and anything that contains carbon like fingers etc. Method is;

3 to 4 part 98% H_2SO_4.
1 part H_2O_2 50%+.

Slowly add peroxide to the acid. The mixture will get HOT and can easily boil so this step is best done in small quantities, with the necessary cooling. (You don't need much, right?) (As H_2O_2 is an oxidiser, the rules of acid to water do not apply here).
This stuff has a shelf life and does not store well at all, make and use hot in small quantities only with the necessary face and hand protection etc. DO NOT try capping it as oxygen is given off during decomposition and this will cause the container to burst.

DO NOT mix this with anything except water, and do this with care. It will cause explosive reactions with any of the organic solvents like ethanol, acetone etc etc.

Varnish for holding coils together.

A nice one would be one of the Novathane range if I remember the name correctly, one of the outdoor versions. It is a TDI polyurethane composition, dries reasonable fast and should not affect things much as long as you don't put it on inches thick. Advisable to leave it alone for 24 hours so that cross linking can be completed as the dielectric constant changes with polymerisation. A better way would be wax.

73 de RON

Editor's Comments

ments? Its easy, subscribe to the Elektor magazine (the free bit) on the web and have them send you the latest news.

See the link for more details:-
http://www.elektor.com/elektor-uk.35.lynkx

Cold weather ahead!

In the US, most amateurs use the Winter months to construct projects in their “Shacks”. In South Africa, we have other things to worry about. We try and conserve electricity and wonder when the next “load shedding” is going to happen. Most of our equipment is able to run off 12 to 13.8 Volt battery power. So it should be the time of checking on the charge currents and status of the batteries. Unfortunately the inverter and generator market has gone through the roof with prices as the demand spiked earlier this year.

Maybe its time for a club project to build a shack inverter?

An old one but good

'n Boer maak 'n plan, maar 'n "Coloured" maak MAGIC

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ANTENNA BASICS

What are the basics of antennas?

Antennas, to quote a friend, are one of life's eternal mysteries. "All I'm totally certain of is that any antenna is better than no antenna and the antenna should preferably erected as high and be as long as is possible or desirable". Here we will discuss the very basics of antennas. Remember that thought: these are just some introductory antenna basics. Each type of antenna will eventually have its own page. In particular I would commend everyone to read my page on earth dangers. I think it ought to be compulsory reading.

The basic antenna

The most basic antenna is called "a quarter wave vertical", it is a quarter wavelength long and is a vertical radiator. Typical examples of this type would be seen installed on motor vehicles for two way communications. Technically the most basic antenna is an "isotropic radiator". This is a mythical antenna which radiates in all directions as does the light from a lamp bulb. It is the standard against which we sometimes compare other antennas.

This type of antenna relies upon an "artificial ground" of either drooping radials or a car body to act as ground. Sometimes the antenna is worked against an actual ground - see later.

Antenna Polarisation

Depending upon how the antenna is orientated physically determines it's polarisation. An antenna erected vertically is said to be "vertically polarised" while an antenna erected horizontally is said (not so surprising) to be "horizontally polarised". Other specialised antennas exist with "cross polarisation", having both vertical and horizontal components and we can have "circular polarisation".

Note that when a signal is transmitted at one polarisation but received at a different polarisation there exists a great many decibels of loss.

This is quite significant and is often taken advantage of when TV channels and other services are allocated. If there is a chance of co-channel interference then the license will stipulate a different polarisation. Have you ever noticed vertical and horizontal TV antennas in some areas. Now you know why.

Antenna Impedance

Technically, antenna impedance is the ratio at any given point in the antenna of voltage to current at that point. Depending upon height above ground, the influence of surrounding objects and other factors, our quarter wave antenna with a near perfect ground exhibits a nominal input impedance of around 36 ohms. A half wave dipole antenna is nominally 75 ohms while a half wave folded dipole antenna is nominally 300 ohms. The two previous examples indicate why we have 75 ohm coaxial cable and 300 ohm ribbon line for TV antennas.

A quarter wave antenna with drooping quarter wave radials exhibits a nominal 50 ohms impedance, one reason for the existence of 50 ohm coaxial cable.

The quarter wave vertical antenna

The quarter wave vertical antenna is usually the simplest to construct and erect although I know a great many people who would dispute that statement. In this context I am speaking of people (the majority) who have limited space to erect an antenna.

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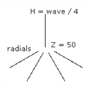

Figure 1. - a quarter wave vertical antenna with drooping radials

In figure 1 we have depicted a quarter wave vertical antenna with drooping radials which would be about 45 degrees from horizontal. These 45 degree drooping radials simulate an artificial ground and lead to an antenna impedance of about 50 ohms.

A quarter wave vertical antenna could also be erected directly on the ground and indeed many AM radio transmitting towers accomplish this especially where there is suitable marshy ground noted for good conductivity. An AM radio transmitting tower of a quarter wave length erected for say 810 Khz in the AM band would have a length of nearly 88 metres (288') in height.

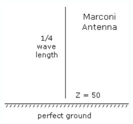

Figure 2. - a marconi antenna

The formula for quarter wave is L = 71.25 metres / freq (mhz) and in feet L = 234 / freq (MHz). Note the variance from the standard wavelength formula of 300 / freq. This is because we allow for "velocity factor" of 5% and our wavelength formula becomes 285 / freq.

When a quarter wave antenna is erected and "worked" against a good rf ground (called a Marconi Antenna) the earth provides a "mirror" image of the missing half of the desired half wave antenna.

In figure 2 above where I have depicted the Marconi Antenna imagine a duplicate of the quarter wave antenna being in existence from the top of the ground and extending down the page. This is the mirror image.

Half wave dipole antenna

The half wave dipole antenna becomes quite common where space permits. It can be erected vertically but is more often than not erected horizontally for practical reasons. I gave quite a good example of its use in my paper on radio telescopes from my original site. I have reproduced it in figure 3 below.

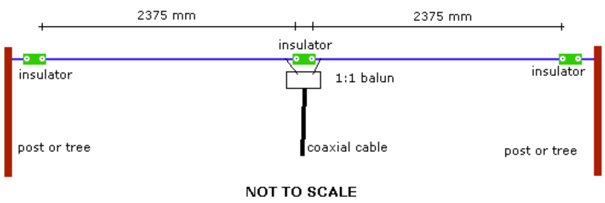

Figure 3. - half wave dipole antenna

This particular antenna was dimensioned for use at 30 Mhz. You will note that the left and right hand halves are merely quarter wave sections determined by the formula given earlier. The input impedance (affected by many factors) is nominally 50 ohms.

As with all antennas, the height above ground and proximity to other objects such as buildings, trees, guttering etc. play an important part. However, reality says we must

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live with what we can achieve in the real world notwithstanding what theory may say.

People erect half wave dipoles in attics constructed of fine gauge wire - far from ideal BUT they get reasonable results by living with less than the "ideal". A lesson in life we should always remember in more ways than one.

The folded dipole antenna

The folded dipole antenna is probably only ever seen as a TV antenna. It exhibits an impedance of 300 ohms whereas a half wave dipole is 75 ohms and I'm certain someone will be alert enough to ask "why 75 ohms, if figure 3 above is 50 ohms?".

Within the limits of my artistic skills I have depicted a folded dipole antenna below.

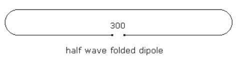

Figure 4. - half wave folded dipole

One powerful advantage of a folded dipole antenna is that is has a wide bandwidth, in fact a one octave bandwidth. This is the reason it was often used as a TV antenna for multi channel use. Folded dipole antennas were mainly used in conjuction with Yagi antennas.

The Yagi antenna

The Yagi antenna or more correctly, the Yagi - Uda antenna was developed by Japanese scientists in the 1930's. It consists of a half wave dipole (sometimes a folded one, sometimes not), a rear "reflector" and may or may not have one or more forward "directors". These are collectively referred to as the "elements".

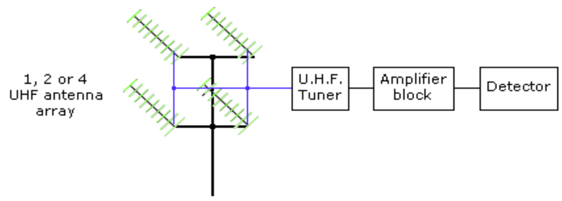

Figure 5. - the Yagi antenna

In figure 5 above I have reprinted a UHF Yagi antenna array from my radio telescopes page. You will note, not altogether clearly.

However in figure 6 below, which happens to be a photograph of a neighbour's TV antenna, I can clearly point out details of a practical Yagi antenna.

This particular antenna has been optimised for dual band operation. It is designed to pick up both VHF and UHF transmissions. Because I live in a regional of NSW in Australia, TV antennas tend to be single channel types designed either for higher gain or better directivity. Different examples will be presented later.

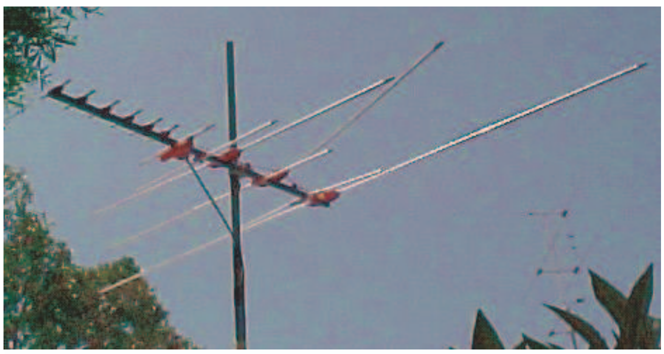

Figure 6. - a practical Yagi TV antenna

Looking from left to right on this dual band Yagi we have six UHF "director" elements which improve gain and directivity. Next is the UHF half wave dipole which could have easily been a folded dipole but is in fact a plain half wave

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dipole.

The next three much longer elements form a "phased array" for the VHF band. I am unsure of the function of the three remaining smaller elements, information is quite scant here but one would certainly be a UHF "reflector". Likely the other two also fulfill this function also.

Note: This is a horizontally polarised antenna and is orientated roughly NNW, 315 degrees.

You will notice the effect of very strong storms from the sea have had in bending the second larger elements. In my locality storms are a problem but not as much as roosting parrots such as large sulphur crested cockatoos.
UHF Yagi antenna

In the photograph in figure 7 below you can see a classic UHF Yagi antenna. It has a total of nineteen "elements" comprising seventeen "directors", a fancy folded dipole with a "low-noise mast head amplifier" and a "reflector".

[Not included - see web site]

Figure 7. - a vertically polarised UHF Yagi antenna

This is a a vertically polarised UHF Yagi antenna and it is orientated WSW or 225 degrees. It does in fact pick up signals about 100 Km or 60 mile distant from Sydney.

This is the very same antenna I was suggesting to be used in the radio telescope array I depicted in figure 5 above.

Stacked half wave dipoles or a collinear array

The majority of TV antennas in my retirement village are stacked half wave dipoles. These consist of four sets of a half wave dipole and a reflector only, but mounted one above another. These antennas owe their origin to the days we only had VHF TV in the area. Surprising with the introduction of UHF they continued to function quite well in picking up UHF as well. This particular antenna is my one and I've never had the need to go to a UHF antenna. The top two elements normally are home to roosting "top knot" pidgeons, a pigeon native to Australia.

Figure 8. - four stacked half wave dipoles collinear antenna

To the left of the photograph are the "reflectors" and to the right are the four vertically stacked half wave dipoles. The wires connecting each half wave dipole are done in a "phased way". This comprises a collinear antenna array and is so arranged for improved gain.

Note this antenna is horizontally polarised.

Loop Antennas

The loop antenna comes in an amazing number
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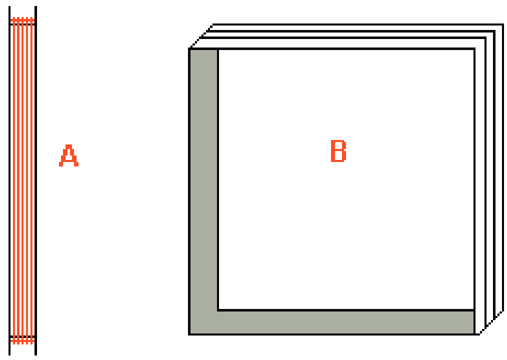
of configurations. It is a "small space" antenna and although extremely inefficient is capable of surprising results. In receiving applications the loop antenna works on the principle of the "differences" in voltages induced by the current flowing in the sides of the antenna. As you might imagine these difference voltages can be extremely minute in amplitude and any loop



antenna usually requires an associated amplifier capable of at least 25 dB power gain following it.

One example of a shielded loop antenna is taken from my tutorial on mobius winding techniques is shown in figure 9 below.
Figure 9. - mobius winding of a loop antenna

This is the general loop antenna which has one interesting characteristic. It responds well to signals arriving in one direction, either from the left hand side of your computer screen or the right hand side of your computer screen for the loop shown in figure 9 (b) above. Signals from either your face or from behind your monitor would produce equal signal currents from both sides of the loop and consequently produce no difference voltage output.

Technically speaking, a loop antenna responds to the magnetic field rather than the electric field.

Rather than being omnidirectional (as a whip antenna would be) the loop antenna responds to the cosine of the angle between its face and the direction of arrival of the electromagnetic wave. This actually produces a figure eight pattern, which for receiving presents no probems. The addition of a small whip antenna in conjuction with proper phasing allows the direction ambiguity to be resolved and we have an antenna relatively ideal for direction finding.

The most common loop antenna you will encounter is the loopstick antenna [in the U.K. it is referred to as a "ferrite rod antenna"] built into portable receivers. In figure 10 below is the AM and shortwave loopstick antenna in a Sanyo model RP2127 MW / SW receiver (it's old).

[Not included - see web site]

Figure 10. - AM and shortwave loopstick antenna

The AM and shortwave loopstick antenna is located in the upper half under the words "loopstick antenna". For greater efficiency and size reduction, a loopstick antenna is wound on a "ferrite" rod. This particular one happens to be circular but you may encounter ones which are rectangular.

As an experiment you might, if you have a loopstick antenna radio available, tune to a weak station and rotate the radio around 360 degrees. You should notice two points 180 degrees apart where the signals seem to be the strongest and similarly notice two other points 180 degrees apart where the signals seem to be the weakest - these are called "nulls". This is the aid to "Radio Direction Finding - RDF".

Using the Small Loop Antenna
[Joseph J. Carr, Universal Radio Research]

Small loop antennas have an overall wire length < 0.15 ?. They exhibit deep nulls perpendicular to the plane of the loop, and broad maxima off the ends of the loop. The pattern of these small

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loop antennas is a variant of the classic "Figure-8" pattern. Although the loop has less gain than a dipole, the radiation pattern and small size make the antenna quite useful for certain situations...

The K9AY Terminated Loop — A Compact, Directional Receiving Antenna

Wish you had enough room for an effective low-band receiving antenna? You do! This four-direction system fits in a 30-foot circle!

By Gary Breed, K9AY

Low-band operators are always looking for ways to improve their hearing. As a low-band fan, I was impressed with the EWE antenna developed by Floyd Koontz, WA2WVL. [1, 2] Koontz shows us how to build a compact, directional antenna—a design that quickly became very popular. But when I sat down at the computer to figure out the best way to install my own EWEs, a surprising new design emerged from my modeling experiments...

K9AY Terminated Loop — A Compact, Directional Receiving Antenna - PDF File 159 kB.

Terminated Tilted Folded Dipole

Now here is a little gem. The terminated tilted folded dipole is bound to give a "rush of blood to the head" of any avid DX'er (that means long distance -dx- receive / transmit enthusiast).

The terminated tilted folded dipole is somewhat similar to the half wave folded dipole in figure 4 above yet the claims for its performance are quite astonishing. The terminated tilted folded dipole is claimed to have a bandwidth of something like 5 or 6 to one, been extensively tested and adopted by the US Navy, easy to construct from readily available materials and, has a feedpoint impedance of around 300 ohms.

Terminated Tilted Folded Dipole

Figure 11. - Terminated Tilted Folded Dipole

The dimensions "A" and "B" for a terminated tilted folded dipole are as follows:

Each leg "A" = [2 X pi (15.25 / Fo)] and;

Distance "B" = [2 X pi (0.915 / Fo)]

where in both instances 2 X pi = 6.28 and Fo is in Mhz.

There seems to be some debate about the exact formula, my friend L. B. Cebik (see next) says:

"The "Wide-Long" version coincides with standard construction formulations, since the antenna is about 300/F(MHz) long and 10/F (MHz) wide. (Excessively fussy cutting formulas for this antenna are largely superfluous, since strict resonance is not in question)."

My friend L. B. Cebik (see later) has modeled this antenna.

Modeling the T2FD

Further comprehensive details on the claims for the amazing terminated tilted folded dipole antenna and its construction can be found at:

http://www.hard-core-dx.com/nordicdx/antenna/wire/t2fd.html

Conclusion on antenna basics

The reason there has been emphasis on TV antennas is simply because nearly everyone can look at examples in their own locality for comparison. At TV frequencies the physical dimensions are such I can offer practical

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examples with photographs.

The same basic principles apply at HF and LF although physical sizes tend to be totally impractical.

As time permits I will flesh out more and more in depth articles on all these antennas and even more types not even mentioned here. This page alone comprises well over 2,000 words so you can imagine the job ahead with competing demands on my time. Meanwhile consider this important publication [below] on antennas.

Meanwhile I would also suggest that you take a good look at L.B. Cebik 's W4RNL great web site. My good friend LB is "THE antenna guru".

[Taken from his excellent web page: http://www.electronics-tutorials.com/antennas/antenna-basics.htm]

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Editor's Comments

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An old man lived alone in Cape Town. He wanted to spade his potato garden, but it was very hard work. His only son, Clemence, who used to help him, was in Polsmoor Prison.

The old man wrote a letter to his son and described his predicament.

"Dear Clemence, I am feeling pretty bad because it looks like I won't be able to plant my potato garden this year. I'm just getting too old to be digging up a garden plot. If you were here, all my troubles would be over. I know you would dig the plot for me.

Love,
Papa"

A few days later he received a letter from his son.

"Dear Papa, For heaven's sake, Papa, don't dig up that garden, that's where I buried the BODIES.

Love, Clemence"

At 4 A.M. the next morning, the Scorpion Unit, NIA agents and local police showed up and dug up the entire area without finding any bodies. They apologized to the old man and left. That same day the old man received another letter from his son.

"Dear Papa, Go ahead and plant the potatoes now. That's the best I could do under the circumstances.

Love Clemence

{—}

Don't forget the 21st of June is the shortest day and the longest night here in South Africa.

JB 2008

The West Rand Amateur Radio Club
26.14122 South - 27.91870 East

P.O. Box 562
Roodepoort
1725

Phone: 082 573 3359 (Chairman)
Email: **zs6wr@gmail.com.**
Web page: www.jbcs.co.za/ham_radio

Bulletins (Sundays at …)
11h15 Start of call in of stations
11h30 Main bulletin start

Frequencies
439.000MHz 7.6MHz split
Input: 431.4MHz (West Rand Repeater)
145,625 MHz (West Rand Repeater)
10,135 MHz (HF Relay)

Radio Amateurs do it with more frequency!

Chairman	Stuart Baynes	ZS6OUN	082 573 3359	sbaynes@iafrica.com
Vice Chairman	Ron Eva	ZR6RON		ronnie@calidus.co.za
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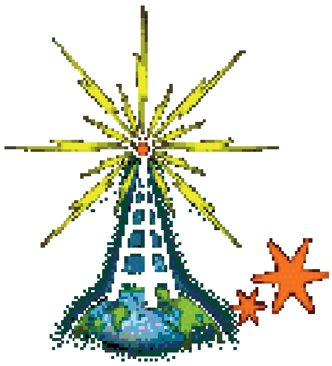
West Rand members - we need your input!

To make this the best ham radio magazine in South Africa we need your input. Please submit articles, comments, suggestions etc.

Please send plain text with no formatting to the email address below.

In July 2003, we re-published an Anode Compendium on CD. It has the issues from July 2000 until June 2005. This included the new Adobe reader. It has been updated, check with the chairman for details.



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