THE WEST RAND AMATEUR RADIO CLUB

August 2009
Volume 10, Issue 2

ANODE

Inside this issue:

Editor's Comments

Volume 10, Issue 2
August 2009

Anode Delayed!

This month's issue is late! Flu (whether pig or normal) has got to me over the last few days. Putting me totally out of commission and unwilling to go out into the cold night air.

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[From Stuart]
Dear All,

Just to let you know I set up the APRS beacon (ZS0HTN) at the club house this morning - Thanks Craig for letting me in.

Radio & TNC are 100% unfortunately that can't be said of the computer.

All the com ports are down except the Mouse com 1. After fiddling about I have the system working on only Com

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A TDOA Antenna Unit for Fox-Hunting

Special points of interest:

- Contact details on back page (corrected & updated)
- Ham-Comp Latest on web site.

At some point in your hunt for the elusive "fox", you will (with luck) be so close that simple field-strength direction-finding techniques may no longer work. The "fox"'s signal will be so strong that it will swamp your attenuator and leak through the plastic parts of your radio's case, resulting in "S9+" signal-strength readings in every direction, regardless of attenuator settings or antenna orientation. A "Time Difference of Arrival (TDOA)" antenna unit will put you back on the "hunt".

How big a truck will I need?

A TDOA antenna unit is simple and easy to build, and will work with any 2m FM mobile or handheld. There are many different designs of TDOA units, and some have additional "bells and whistles" (such as left/right indicators), but the basic design (which is all you really need) consists of a small dual-antenna array and an electronic antenna-switching unit.

The antenna array usually consists of two vertical dipole antennas separated 12 to 36 inches apart, often mounted on a T-shaped support so that the array can be rotated. The purpose of the antenna-switching unit is to alternately and rapidly switch the input of your FM receiver between the two dipoles. The switching rate is typically 1000 times per second. Switching is accomplished by a square-wave oscillator which alternately forward- or reverse-biases diodes connected in the circuit path between each dipole and the receiver. Common silicon switching diodes will work OK, but PIN diodes work best.

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Editor's Comments

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1 so there is no mouse control of the computer and also no future expansion possible.

I would suggest that the committee get together and ask John to make up a good 'Comms' computer with at least 4 serial ports / 4 USB ports (USB2) + network and sound card - it does not need to be new but it must work and use Windows XP - Sorry john no Linux!! I have an idea on adding HF APRS plus 70 cm DX cluster streaming from the internet once the Cell phone blocks are in place.

Anyway its working so enjoy.
Cheers
Stuart

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[My reply]
Hi Stuart

I thought I would leave this for Monday morning. So I could give you the "bad news".

The Club/Ham Comp has no "spare PC's" that will run Windows XP. We gave all the PC's away to members that wanted them. What we have left will run embedded software and hardware for a variety of functions.

But none of them are capable of running Windows 2000 or XP (or definitely NOT Vista).

There are also no spare Windows XP PC's ever! Not around SA nor overseas. They will be jealously guarded by their owners for the foreseeable future.

As M$ has now "closed the door" on Windows XP. You can only get it now if you buy a Net Book.

The upgrade voucher to Windows 7 is available around R150. But that's only for PC's that have Vista.

Of course you can do what the other guys do, steal one/acquire one!

But the chances are that Win XP will fail gradually over the next year or so. I have been observing these so called "patches" take over the existing PC's and eventually failing with incompatible drivers or newly installed hardware. One of the vital backup regimes to do now is backup the partition and start up files of your XP PC now. I will cover this on Saturday.

The veteran Windows 98 PC was incredibly tolerant of all the power outages as well. That will not be the case with a Windows XP PC. The Windows 98 could be made to provide four communications ports in the original hardware. I have made a lot of these "communications PC's" work reliably.

Other radio amateurs use Linux for several good reasons. Its free and reliable. It also supports all the new hardware at a much higher transfer rate than Windows. Even networking is ten times faster than Vista over 100 MbS (100 Mega bits per Second) Ethernet.

It also runs Windows applications of all sorts under WINE reliably.

See the recent article in the Anode. [Ham and WINE go together] I have used it myself to run some Windows 98 games exceptionally well. This was to keep the kids happy…

Sorry Stuart. But the club will have to buy a second hand legit Windows XP PC, if you want the specification cited.

best regards
John Brock

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Editor's Comments

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[Helping people with "computer problems" since 1987]
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Website (corporate): http://www.jbcs.co.za
Test and Trial page: http://jbcs.dnsalias.net
Amateur Radio page : http://www.jbcs.co.za/ham_radio

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MFJ Acquires Cushcraft
Published on 08/07/09 at 19:03:20 GMT by KK2DOG

NewsOn August 7, MFJ Enterprises announced they had purchased the Cushcraft Amateur Radio antennas product line from Missouri-based Laird Technologies effective July 31. According to MFJ, Cushcraft -- makers of HF/VHF/UHF vertical, beam and Yagi antennas for the Amateur Radio community -- will continue to be manufactured in Manchester, New Hampshire. "We are excited to have the Cushcraft Amateur Radio Antennas product line alongside our other five companies," said Martin F. Jue, President and founder of MFJ Enterprises, Inc. "This product line increases our ability to offer our customers a wide range of antenna options at different prices. Customers will be able to choose from Cushcraft Amateur Radio antennas, Hy-gain and MFJ antennas through one source." MFJ purchased Hy-gain in 2000 the company also owns Ameritron, Mirage and Vectronics. Jue said that the Cushcraft line will bring more than 50 new products to MFJ's Amateur Radio product line. "We will add more new products to this antenna line and will continue the Cushcraft Amateur Radio antennas name long into the future. Cushcraft Amateur Radio antenna product customers will appreciate the continued and expected top-quality manufacturing of this product in New Hampshire and the MFJ commitment to superb after-the-sale service and tech support in Mississippi," said Jue. The 120 page 2010 MFJ catalogue will include the entire Cushcraft Amateur Radio antennas product line. MFJ has set up a special customer support line -- 662-323-5803 -- to handle Cushcraft antenna product technical support, parts requests and customer services.

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Watts has an excellent article on vertical Antennas. Go read it!

Vertical and Horizontal Antennas:
A Performance Comparison
By
Author: Vincent Harrison ZS6BTY
Date: 15th June 2009

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1981 theory confirmed: electrons split in spinons and holons
http://www.elektor.com/news/1981-theory-confirmed-electrons-split-in-spinons.1032879.lynkx?utm_source=UK&utm_medium=email&utm_campaign=news

Radio telescope project takes latest step with power and fibre optical cables contract
http://www.engineeringnews.co.za/article/radio-telescope-project-takes-latest-step-with-power-and-fibre-optical-cables-contract-2009-08-06

A TDOA Antenna Unit for Fox-Hunting

(Continued from page 1)

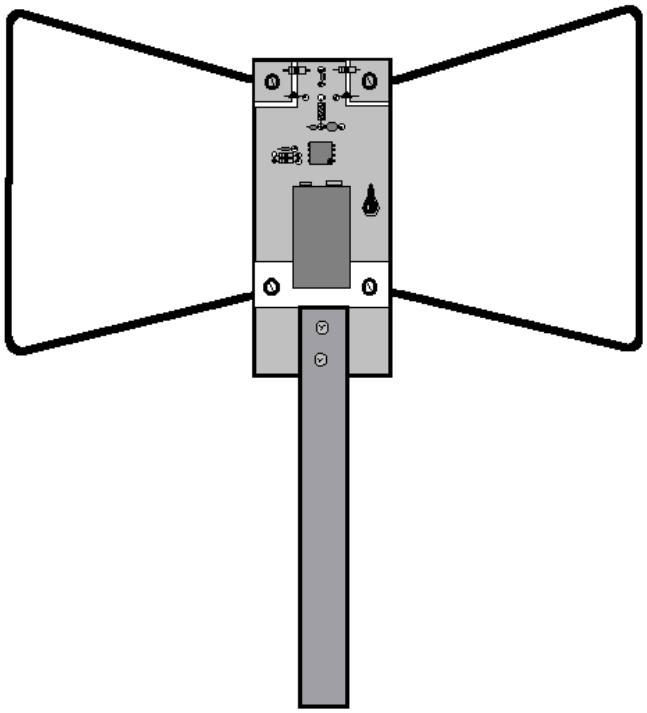

Fig. 1 - The assembled TDOA antenna unit - coaxial cable to receiver runs behind the PCB and through the PVC pipe handle.

How does it indicate direction ?

The TDOA works by detecting the difference in the phase of the RF signal received by each dipole.

If both dipoles are exactly the same distance from the RF source (the "fox"), the phase of the RF signal will be the same at each antenna. If you rotate the array, or the RF source moves to the left or right, then one dipole will be closer to the source than the other one, causing a small phase difference between the signals received. Your FM receiver will then detect an abrupt change in the phase of the RF signal it receives as the antenna switching unit switches rapidly back and forth between the two dipoles. To the receiver, the signal looks like square-wave- modulated FM ! Your receiver's speaker will emit an audio tone at the antenna-switching frequency. As the phase difference increases, the tone becomes louder. When both dipoles are equidistant from the source, the tone almost completely disappears.

One disadvantage of the TDOA is that when you have found the "null" or antenna position where the tone disappears, you cannot tell if the source is directly in front of you or directly behind you.

Fortunately, there are other ways to determine this. A quick way, if you are using a handheld, is to use the "body shield" method - disconnect the antenna, hold the handheld close to your chest so that you can see the signal strength indicator, and turn your body. When the indicated signal strength is minimum, the source is somewhere behind you. Another technique involves converting the TDOA antenna to one which has a cardioid or heart-shaped radiation pattern - the null (which corresponds to the "notch" in the heart-shape) can be used to point a rough bearing to the source.

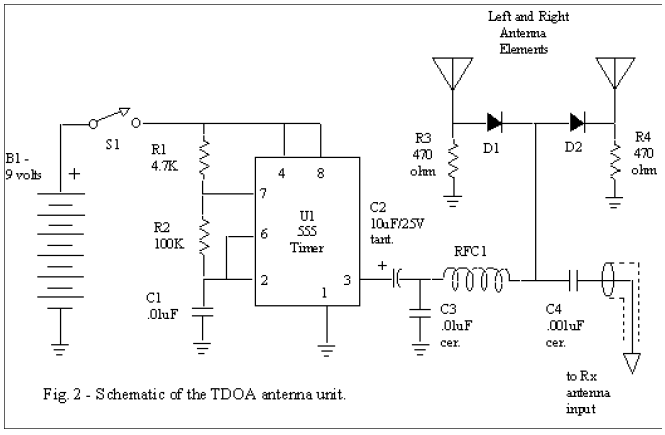

Fig. 2 - Schematic of the TDOA antenna unit.

A quick (1-2 evening) TDOA antenna unit

You can build a simple TDOA unit in an evening or two for about $10 or less (depending on the size of your junk-box). The circuit, shown in Fig. 2, is based on one in an article by Paul Bohrer (ref 1). U1 is a 555 timer powered by a 9V battery, oscillating at about 1 kHz. R1, R2 and C1 determine the frequency of oscilla-

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A TDOA Antenna Unit for Fox-Hunting

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tion. The output of U1 is a square-wave from +9V to ground. C2 allows the square-wave to be level-shifted to between +4.5V and -4.5V.

The positive half of the square-wave's cycle turns on (forward-biases) D1 and turns off (reverse-biases) D2; the negative half of the cycle does the opposite. R3 and R4 limit the forward bias current for each diode to about 9 mA.

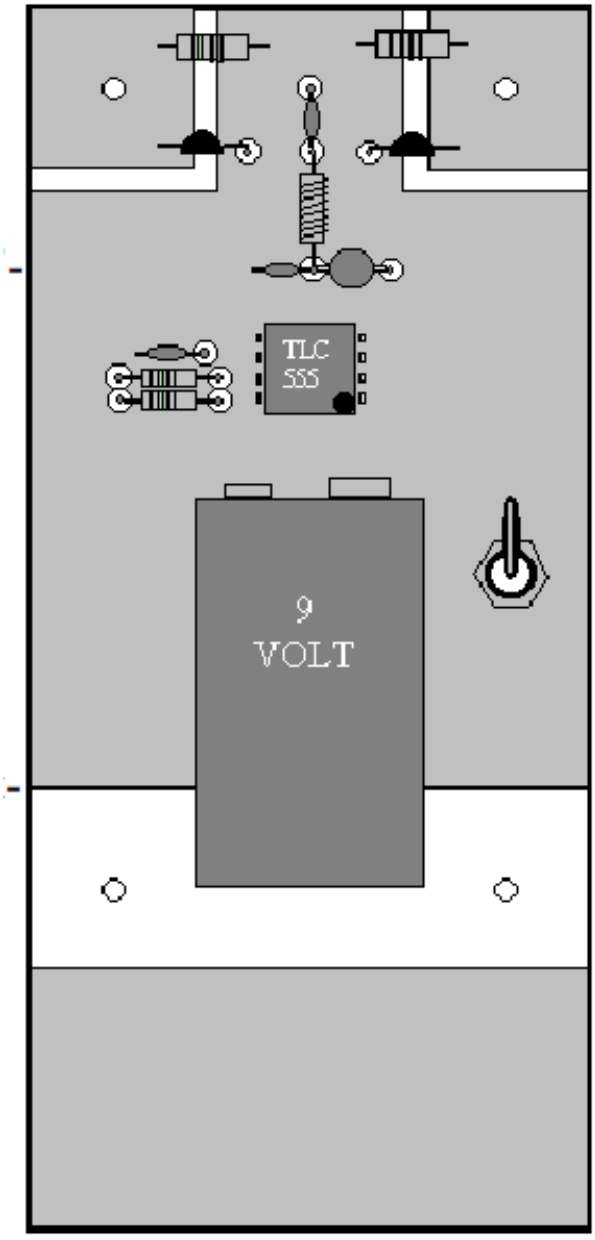

Fig. 3 - PCB component layout.

When the diode is turned on, the RF signal received by that diode's dipole is conducted through the diode and coupled through C4 to the coaxial cable to the receiver.

When the diode is turned off, the RF signal (from that diode's dipole) is blocked. RFC1 presents a high impedance to the RF signal so that it is not shunted by the oscillator circuit, but passes the relatively low-frequency square-wave to the diodes. RFC1 together with C3 also comprise a low-pass filter to prevent the high-frequency components of the square-wave from getting into the antenna circuit and the receiver. If you forget to install C3 (I did), you'll hear a continuous "hash" of switching noise.

A rough PCB layout with approximate dimensions is shown in Fig. 3. Layout is not critical, but try to keep the wiring between the antenna elements, diodes and coax as short as possible.

I also tried to keep the battery and coaxial cable exactly centred so that they would not affect one antenna element more than the other, but I'm not certain if this is really necessary. The coaxial cable lead to the receiver runs down the back of the PCB and through the PVC-pipe handle.

The PCB can be "etched" using a sharp exacto-knife (watch your fingers!) and a drill-bit. Score around the areas of copper-clad that you want to remove with the exacto-knife, then peel away the copper. I use a pad-cutter tool to isolate pads in the copper, but you can clear the copper around holes with a sharp 1/8" drill bit - for a handle, use a 1 shaft knob with set-screws. This prevents shorts between the copper ground-plane and component leads which pass through holes in the PCB.

I made a "bow-tie" antenna based on the "Handi-Finder" article (ref 2).

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A TDOA Antenna Unit for Fox-Hunting

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Each element is a square "U", 6 inches across the bottom with 6-1/2" long arms. Each arm has a loop at each end for mounting to the PCB with #6 nuts and screws. It does not give as loud a tone or as sharp a null as two dipoles spaced 3 feet apart, but it's a lot smaller. I used coat-hanger wire, but stiff #12 copper wire or brass brazing rod would probably be better. The handle can be anything, preferably non-metallic, such as a short length of PVC pipe, wooden dowel or broomstick with a slot sawed in one end for the PCB.

Any 555 timer IC will work with this unit (there must be over 15 different semiconductor companies making them) but the CMOS part will nearly double your battery life. You can adjust R1 and C2 to vary the oscillator frequency (if you find a particular tone annoying). RFC1 is not especially critical, figure 1k Ohm impedance or better at 144 MHz. If you have something in your junk-box, try it out by tuning your rig to a QSO in progress with the TDOA antenna unit connected but not switched on, then touch the leads of the RFC between ground and the connection between D1 and D2. If the signal strength drops appreciably, then the RFC does not have a high enough impedance at VHF.

Using the TDOA antenna unit

TDOA antenna units are not designed for transmitting. If your handheld has a "TX inhibit" feature, it's a good idea to enable it when foxhunting with a TDOA. Transmitting into the TDOA may damage your HT, the TDOA, or both.

The TDOA works best with a strong, vertically-polarized signal. Strong multipath reflections caused by nearby vehicles, buildings, fences, power lines, steel lamp-posts, etc. can make the null difficult to detect, or even appear on a wrong bearing. (Note that wily foxes look for places just like these to hide). If possible, look for open areas clear of obstructions and reflectors when taking bearings. If the bearing appears to change as you move around, your location may be affected by multipath. With practice, you'll be able to tell from the tone whether you have a good signal or one distorted by multipath.

Parts List for the TDOA Antenna Unit (Fig. 1)
1. U1 - CMOS 555 timer
2. R1 - 4k7, 1/4W, 5%
3. R2 - 100K, 1/4W, 5%
4. R3,4 - 470R, 1/4W, 5%
5. C1 - 0.01uF, 50V ceramic
6. C2 - 10uF, 25V tantalum
7. C3 - 0.01uF, 50V ceramic
8. C4 - 0.001uF, 50V ceramic
9. D1,2 - PIN diode, MPN3404
10. RFC1 - RF choke, 8 turns magnet wire space-wound over 1/4W carbon comp resistor (100k or greater).
11. S1 - Switch SPST (toggle or slide)
12. Misc. - PCB, 9volt battery, battery holder, stiff wire (for ant.), RG-58 coax and BNC connector.

References and related articles
1. "Foxhunt Radio Direction Finder", Paul Bohrer, W9DUU, 73 Magazine Jul '90, pp. 9-11, (construction article for TDOA unit with left/right indicators).
2. "Build the HANDI-Finder!", Bob Leskovec, K8DTS, QST May '93, pp. 35-38, (construction article). See also "Sense the Right Way to Go with the Handi-Finder", by Joe Moell, K0OV, QST Oct '93 Technical Correspondence, pp.77-78, for cardioid pattern modification.
3. "The HANDI-Finder", Dave Martin, W6KOW, 73 Magazine Dec '93, pp.26-27, (product review).
4. "Homing DF Units", Chapter 8, "Transmitter Hunting - Radio Direction Finding Simplified", Joseph D. Moell K0OV and Thomas N. Curlee WB6UZZ, TAB Books, 1987.
5. "Monitoring and Direction Finding", Chapter 38, The ARRL Handbook - 1993 (70th Edition), the Amateur Radio Relay League.

(Continued on page 7)

A TDOA Antenna Unit for Fox-Hunting

(Continued from page 6)

6. "Direction Finding Antennas", Chapter 14, The ARRL Antenna Handbook - 1991 (16th Edition), the Amateur Radio Relay League.
7. See also the "Homing In, Radio Direction Finding" column by Joe Moell, K0OV, every month in 73 Magazine

A Quadrifilar Helix Antenna for 137 MHz

By George Goodroe, KF4CPJ

After I became a licensed amateur radio operator in August of 1995, I received a QST magazine which had an article that explained it was possible with the right antenna, the Quadrifilar Helix antenna (QHA), to receive the 137 MHz weather satellite transmissions. The article that I read (1) was by an amateur by the name of Buck Ruperto (2), who one year later wrote another terrific article about a program called WxSat (3), that decodes the satellite transmissions (4). After several e-mails back and forth with Buck, I decided to build it. The antenna had fairly good coverage however it was tough to tune and didn't resonate at the optimum 137 MHz. The received pictures were good however they displayed several deep nulls that always appeared at the same place on the files. I can't lay the blame on Buck; his design was good it was just tough to replicate.

Over the next year I worked hard to find other outlets for antennas and discovered a web-site (5) that offered plans for a QHA that seemed easier to build. The elements were fashioned from 3/8 soft copper and had known dimensions. After studying the bill of materials and spending ½ a day scrounging for parts, the antenna went together in about 2 ½ hours. The first pictures that I received displayed marked improvement and I have subsequently built a 2nd QHA for another WxSat enthusiast here in central Florida.

The web-site is very specific about the details involved in building each antenna and I use their instructions specifically to build each unit. My hat is off to Steve Blackmore who wrote the web-site and provided all of the detailed instructions and illustrations (6) of the John Boyer (7) design antenna that is listed here.

The finished model should look like the one labelled "Tall narrow QHA" at the top of this page.

Element Dimensions

- Mast - 1.5m of 32 mm (1 1/4") PVC waste pipe.
- Elements - 8 mm (3/8") mini-bore soft copper tube - 8 copper elbows for the corners.

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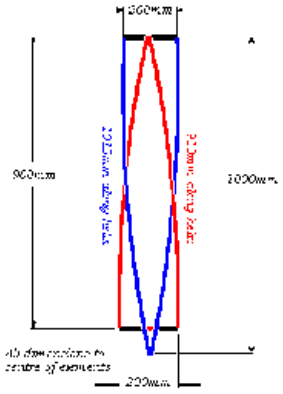
A Quadrifilar Helix Antenna for 137 MHz

(continued from page 7)

- 2 - 190 mm lengths - bottom horizontal tubes
- 2 - 903 mm lengths - short helix elements
- 2 - 1002 mm lengths - long helix elements
- 4 - 90 mm lengths - top horizontal elements

Note - these are cutting dimensions and assume that 90 degree elbows NOT bends are used - The dimensions on the drawing are from centre to centre of the respective elements - you may have to adjust your cutting sizes accordingly.



- 4 self-tapping screws for feed.
- Suitable length of RG58 or UR43 for balun and feed.
- 32 mm cap to plug top end of mast.

Drill 4 - 8 mm holes at 90 degrees to each other 25 mm from the end of the mast - make sure the holes are Square and in the same plane!

Mark and drill the bottom holes remembering they are in opposing pairs spaced 100 mm apart - you're advised to check the measurements at least twice before drilling!!! Drill a 7 mm hole near the top of the mast for the cable entry.

Drill pilot holes in the 4 top elements for self-tapping screws and assemble top tubes, push coax through hole and make top connections with screws.

Wrap the coax 4 times around the mast to form the balun and tape/glue in position. Push the elbows onto the top tubes and measure from the centre of each leg - it should be 200 mm, you may have to cut more off if you used swept bends rather than tight 90-degree elbows. I bought some small cotter pins. During construction they keep the horizontal elements in place...on top I have the cotter pins inside and outside the 1 1/4 PVC...refer to the picture above (8).

Assemble bottom tubes, make sure they are central and square to top tubes. Bend helixes to suit - tip - try and find a former of some type; a suitable log or large pipe makes the bends nice and neat. When your happy with the shape solder up the elbows. It should appear circular when viewed from the end. Check the connections and cap the top end of the pipe. The copper tubes can be fixed to the mast using glue/ silicon sealer and/or tape - make sure you seal the coax entry hole. Push a suitable piece of wood up the bottom end to avoid crushing the PVC tube too much when clamping to the mast.

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A Quadrifilar Helix Antenna for 137 MHz

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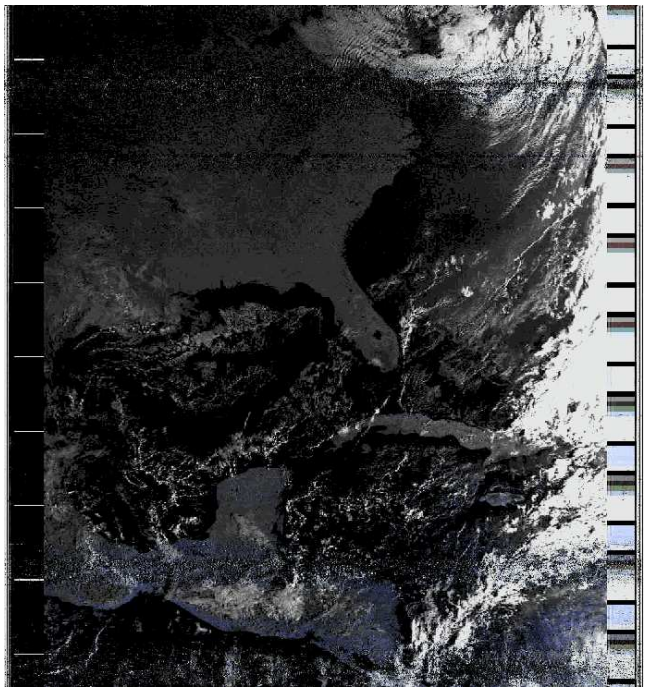
Be sure to build the antenna with the elements twisting in the right direction. The first time I built it I didn't, which resulted in an antenna 180 degrees out of phase…trust me when I say it doesn't help the picture quality!

The NOAA 12 image taken in September 1998 at the end of the article is just one of many fine WxSat images that I have taken down live on the satellites daily passes.



When all is said and done, you should have an antenna that resonates dead on at 137 MHz and will serve you for many years with no real service required.

References

(1) QST August 1996, Build a Quadrifilar Helix Antenna by Buck Ruperto
(2) Eugene Buck Ruperto, W3KH - w3kh@dns.pulsenet.com
(3) WxSat by Christian Bock - http://ourworld.compuserve.com/homepages/hffax/toc20.htm
(4) QST August 1997, An Easy Way to Copy the Weather Satellites by Buck Ruperto
(5) http://www.personal.u-net.com/~pilotltd/qha.htm copyright 1998 Steve Blackmore
(6) All illustrations by Steve Blackmore - steve@pilotltd.u-net.com
(7) John Boyer - john.boyer@rd.bbc.co.uk
(8) Photos and article by George Goodroe - goodroe@worldnet.att.net

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

Frequencies
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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.

We need your input! Email us articles, comments and suggestions please.
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