

April 2004

Volume 4, Issue 9

ANODE

Inside this issue:

Editor's Comments	1
An Introduction To Amateur Satellite Ground Station Antennas	1
The Handi-Tenna 70 cm Portable Antenna	4

Editor's Comments

April 2004

NO "DELIVER IT" ON 2 METERS

Using an illegal long range cordless telephone to deliver culinary delights is going to cost a New Jersey Chinese restaurant a good part of its profits. This, after the FCC levies a \$10,000 against the eatery for operating transmitting equipment on 2 meters without a license. The FCC's Daryl Duckworth, NN0W, has more:

Duckworth: "A Notice of Apparent Liability to Monetary Forfeiture in the amount of \$10000 went to Best Wok of Westville, New Jersey. An agent of the Philadelphia office had DF'd the signal on 145.8376 MHz and inspected the base and mobile units. The restaurant manager stated that he had purchased the long range cordless telephone system in another country and brought it to the United States to operate at the restaurant."

The FCC citation issued

to Best Wok indicated that the telephone in question is not FCC Part 15 certified and is illegal to use in the United States. (FCC, RAIN)

ZA HAM DECODES MSG IN POP SONG

A recent morning radio program called a local radio ham to see if the morse in a new pop song was actually readable.

The ham said that it wasn't 'readable' and meant nothing. ZS0AFJ reacted to this and set about de-

(Continued on page 2)

An Introduction To Amateur Satellite Ground Station Antennas

Special points of interest:

- Contact details on back page
- Boot Sale on the 6th of March. See page 2 for details

There are many kinds of things and have some fun. antenna. HT antennas 500- satellite antennas that I have arranged the infor- 900 mm long (often col- will get you on the birds mation in a progressive lapsible) are very effec- (some better than oth- outline, allowing you to tive for UO-14, but may be ers) and allow you to visualize a step-by-step a little weak for AO-27. If you have a mobile dual- are new to amateur sat- gain some experience band FM radio, try a 1/4 ellites, though, all the and make incremental im- wavelength 2 m antenna options may be confus- provements each time on 70 cm. These antennas ing, or worse, a disin- you try something new. are 3/4 wavelength at 70 centive to try the birds. cm and offer considerable gain above 30 degrees elevation (deaf below that), so listen on high- It's really not that hard. I **Hearing the Birds:** elevation passes. offer below some facts Often, the first challenge is just to hear the satel- about the state of the art lites. The easiest thing to today and I hope it try first is an HT with 70 helps you try some new cm capability and a "gain"

(Continued on page 3)

Editors Comments

(Continued from page 1)
coding the 'morse'.

In true tradition of pop songs with embedded sounds, he played the morse backwards.

Just like the Beatles song, it became clear. The message is "Amateur Radio is Pogrib". ZS0AFJ says this last word is probably the result of the ham using a coke bottle to activate the morse key.



ZS0AFJ

THE URUNGA RADIO CONVENTION

And speaking about ham fests, here's one that's a bit unusual. It's the annual Easter Convention scheduled for Saturday the 10th and Easter Sunday the 11th of April at the Senior Citizen's Hall in the city of Urunga, Uganda.

Events include a 3.5 MHz mobile hunt, pedestrian on 2 meter T-Hunt, a 2 meter mobile multi transmitter hunt and lots more. Sunday will feature the

famous Urunga scramble. A mini contest to see who can make the most contacts in 30 minutes. It's a great show, if you happen to be in Uganda an Easter weekend. (Q-News)

MESH NETWORKS RADIO RELAY SYSTEM

On the emerging technology front, Mesh Networks, whose emergency-response devices

communicate through each other rather than through a centralized command is expanding its technology. This, to work on other kinds of wireless equipment including radios used by emergency service communicators. Rick Johnson, KA9VZD, has more:

Originally developed by the U.S. military, Mesh system of networking lets individual radios serve as repeaters and relay points. This means that a fire-fighter too far inside a building to reach his command post can communicate

with a nearby fire-fighter, whose radio will then repeat the conversation to the next closest radio. This is similar to hams using a programmable mobile radio to extend the hand of their 2 meter or 70 centimetre H-T..

And just like hams have been experimenting, Mesh networks can transmit video, data and position information in addition to audio.

But here's the departure from what radio amateurs are doing. The Mesh technology also has the ability to create super-sized Wi-Fi hot spots. This in itself gives the system wide utility in public service applications.

APRIL CALENDAR

- 1 **SARL 80-Meter QSO Party (1st leg)**
- 3 **SARL AGM and Awards Dinner JHB**
- 3 - 4 SP DX Contest
- EA RTTY Contest
- 9 *Good Friday*
- 10 - 11 Japan IDX CW Contest
- 11 *Easter Sunday*
- UBA Spring SSB Contest
- SARL Hamnet 40-metre Contest**
- 12 *Family Day*
- 14 *Schools open - all provinces*
- 17 Holyland DX Contest
- 18 World Amateur Radio Day
- 24 - 25 Helvetia Contest
- SP DX RTTY Contest
- 25 **SARL President's net**
- 27 *Freedom Day*

www.sarl.org.za/public/contests

An Introduction To Amateur Satellite Ground Station Antennas

(Continued from page 1)

If you want to hear a little better, try a small 70 cm beam. I have plans here for a little 3-element Handi-Tenna. The very popular Arrow Antenna <<http://hometown.aol.com/Arrow146/index.html>> is a convenient and very effective portable antenna. Cushcraft makes a 3+3 dual-band beam <<http://www.cushcraft.com/>> with a built-in duplexer, suitable for both portable or fixed station use. All of these antennas are "linearly polarized." For a great discussion on linear v. circular polarization, see *The Amateur Satellite Handbook*, by Martin Davidorff, K2UBC (available from both ARRL and AMSAT). Small quads, quagi's, and helix's are also workable at 70 cm, but a little more awkward to handle.

Working The "Easy Sats":

Of course, "easy" is a relative term. See the AMSAT web site for some general introductory articles < <http://www.amsat.org/amsat/intro/faqs.html>>. The next step for a home station might be to try a simple, omnidirectional circularly polarized antenna. The most common of these is the M2 eggbeater <<http://www.m2inc.com/>>.

You can also build a popular version of this antenna, but I have found them to be ineffective at low elevation passes (most passes are below 45 degrees 90 percent of the time). An improved version of this



classic design, the *Eggbeater II*, will give pretty fair results from horizon to horizon. The *Eggbeater II* design is fixed right-hand circularly polarized (RHCP), leaving it susceptible to the "fades" common in satellite downlinks (you will not hear 100 % of the pass), but is still an effective, simple antenna--and MUCH better than the "classic" eggbeater. Other antennas in this class are the turnstile, the quadrifilar helix array (QHA), and the Lindenblad.

The next step up is to buy or build a higher gain antenna and rotate it to match the satellite's position (azimuth). Gain in the 6-7 dBi range, corresponding to a 60 degree beam width, is about the maximum that can be utilized without needing elevation control. Unfortunately, there are no commercially available circularly polarized antennas available in

this size/gain range. If you are blocked at the horizon (and up to 20 or 30 degrees) by trees or buildings, I recommend the original Texas Potato Masher. If, however, you have a good view to the horizon, then the *TPM II* antenna is a perfect solution for working all the LEO's as well as AO-10 out to about 25,000 km and even AO-40 under favourable conditions. The *TPM II* antenna does not require an elevation rotor or even accurate pointing (you can do it manually with no trouble). I built mine with coaxial relays to switch the circular polarity, allowing me to optimize both downlink and uplink. I can hear and work ALL the LEOs from horizon to horizon using this simple to build antenna and a TV-type rotator: I have literally thousands of contacts and have Worked All Continents with this antenna.

(Continued on page 4)

An Introduction To Amateur Satellite Ground Station Antennas

(Continued from page 3)

Working AO-10 (not heard since March 2002):

You can work AO-10 with any of the antennas described above when it is near perigee (less than 10,000 km or so with an omni antenna). To work it further out, though, requires considerably more gain. A typical "OSCAR class" station uses 100 Watts on 70 cm for the uplink into a 40 element antenna (20 x 20) and a 22 element (11 x 11) downlink antenna (with mast-mounted pre-amp). Both antennas are circularly polarized and usually switchable. The most common models here in the US are KLM, Hy-Gain, and M2, but many people also use large linear antennas (or arrays of linear antennas). These antennas require both azimuth and elevation control, most often from a Yaesu or Kenpro rotator. The narrow beam width of these antennas also requires precise pointing, making computer control of the rotator almost mandatory: popular devices include FODTrack, Kansas City Tracker, Uni-Trac, and others. This setup is the standard of excellence in satellite antennas today.

Working AO-40:

AO-40 operation is pretty attractive: a high-altitude orbit that repeats every 48 hours (meaning a fixed antenna could work every other day), high gain antennas, and high power transmitters. It appears modes

U/S and L/S will be the most popular combinations for a while. Smaller UHF ground station antennas than those used for AO-10 can be used: many use 70 cm uplink antennas in the 10 dBi range. Most any Yagi-Uda beam in the 4-6 element range will likely

selves to experimentation, so expect to see lots of new and interesting antenna designs published.

(C) 2000, Gerald R. Brown, K5OE

But wait there's more.....



The Handi-Tenna 70 cm Portable Antenna

Here is a high-performance hand-held beam antenna that is easy to build and guaranteed to improve your downlink from the LEO satellites over ANY rubber duck or mobile whip. Like many satellite operators, I own an Arrow Antenna. That antenna is a great performer, but sometimes it is impractical for me to use it—it is just too big. I sometimes can use the dual-band mobile whip (mag

(Continued on page 5)

work. For L-band, 23 cm, antennas in the 20 dBi range are required if you only have a 10 W rig. Many L-band ops use amplifiers with 40 or more Watts. Many operators are taking a wait-and-see approach to AO-40, but if you want to put something up now, you will probably want to consider a small parabolic dish for S-band, 13 cm, as a starter system. For about \$200 you can get a 3' BBQ dish and a low noise MMDS down converter modified for 2 m. The microwave bands lend them-

The Handi-Tenna 70 cm Portable Antenna

(Continued from page 4)

mount) on my truck, but only on passes above 45 degrees (deaf below that).

What I really wanted was a small hand-held antenna I could fit under/behind the seat of my truck and just point out the window during a LEO pass. I recently conducted some experiments on a 4-element beam antenna for mode J downlink where I employed a folded-dipole feed to transform the feed impedance up from 25 Ohms to 100 Ohms--making circular polarization matching easy. I still had these parts laying around the garage (a.k.a. the R&D lab) and ...

Design:

First, the design criteria:

1. It had to be flat enough to slide under my truck seat.
2. It had to be less than 18" overall length.
3. It had to cost less than \$2.00 to build.

This first criterion rules out any sort of circular polarity scheme. The second, allowing for a handle, limits the actual antenna length to about 12". This last goal, of course, is up to the builder, but easily accomplished.

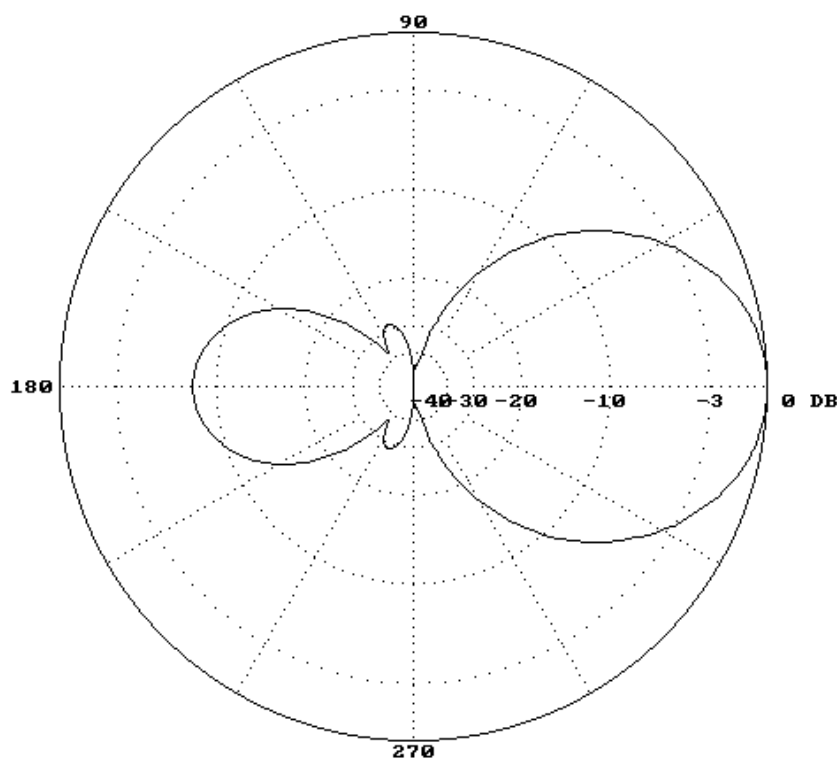
I designed this antenna as a very high-gain 3-element Yagi-Uda parasitic array. It has almost 10 dBi of free-space gain (9.7 dBi free-space and 15 dBi at 5' elevation). This high

gain is at the sacrifice of two key variables: front-to-back ratio and feed point impedance. The E-Plane azimuth plot at the right depicts the gain pattern. The minimal front-to-back ratio, about 8:1, should not pose a problem unless you are in an area of extremely high intermod interference. The nominal feed point impedance is a very low 12.5 Ohms for a conventional dipole feed. Instead, a folded-dipole feed element is used to transform the feed point impedance up to 50 Ohms (4:1 ratio). Of course, this antenna is linearly polarized.

Construction:

The basic antenna is built around a "boom" of 1/2" PVC pipe cut to 18" length. The antenna itself uses 12" of the boom length and I left 5" at the rear for the "handle" and 1" at the front to attach a PVC cap--gives it that *finished* look. A PVC coupling is used at the feed point to connect a couple of # 6-32 x 1/2" stainless steel bolts/nuts/washers to the coaxial cable (with crimped style ring terminals). All three elements are formed from 10 gauge wire (insulated). The table below lists the dimensions and the sketch depicts the layout. These dimensions are fairly critical and you should strive for +/- 1/16" accuracy. All copper wire is used and the coax (with ring lugs) connects directly to the driven element to minimize Ohmic losses.

(Continued on page 6)



The Handi-Tenna 70 cm Portable Antenna

(Continued from page 5)

E1. Length Spacing Ref

13.00 (33 cm) 0.00

DE See Sketch 4.50 (11.5 cm)

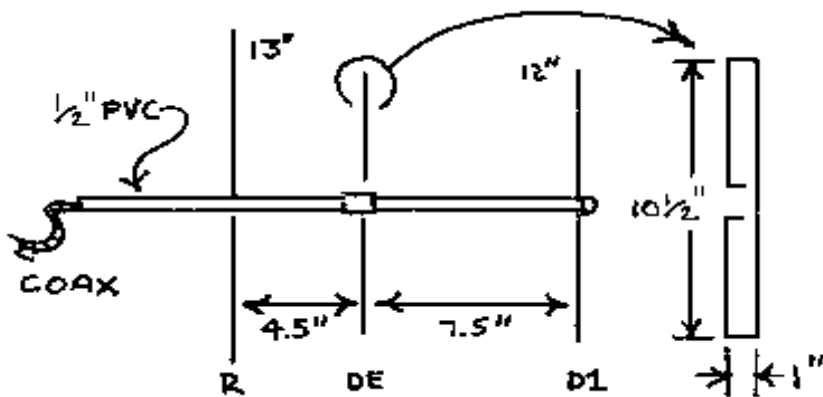
D1 12.00 (30.5 cm) 12.00 (30.5 cm)

Install the driven element (make slightly larger and trim

director in place and then spray painted the whole assembly a traditional aluminium colour for a nice finished look. After all, if you are going to wave this thing around in the air and point it up in the sky, you want it to look pro-

With LEO satellites, every fraction of a dB counts.

As the bird (AO-27) comes over the horizon, I hear the tell-tale signs of FM quieting. By 5 degrees above the horizon I can make out about 50 percent of the in-and-out audio. By 10 degrees above the horizon, the signal is strong and by 15 degrees it is full quieting. In terms of comparison, I get full-quieting at about 5 degrees with my Arrow Antenna.



for SWR) and the director, but just try taping the reflector to the boom first. After adjusting the driven element for best SWR at 436.8 MHz, you can move the reflector slightly to get the SWR perfect. I used glue to hold the reflector and

professional for the dumb-founded onlookers :-)

I used RG-8X and not the more common RG-58. For an equivalent 10' (2.5 m) of coax, RG-58 has 1.2 dB loss while RG-8X has only 0.8 dB loss.

Testing an early prototype. Note the 3/4" PVC boom. My lovely assistant, Lauren, out in the antenna "test range."



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The Handi-Tenna 70 cm Portable Antenna

(Continued from page 6)

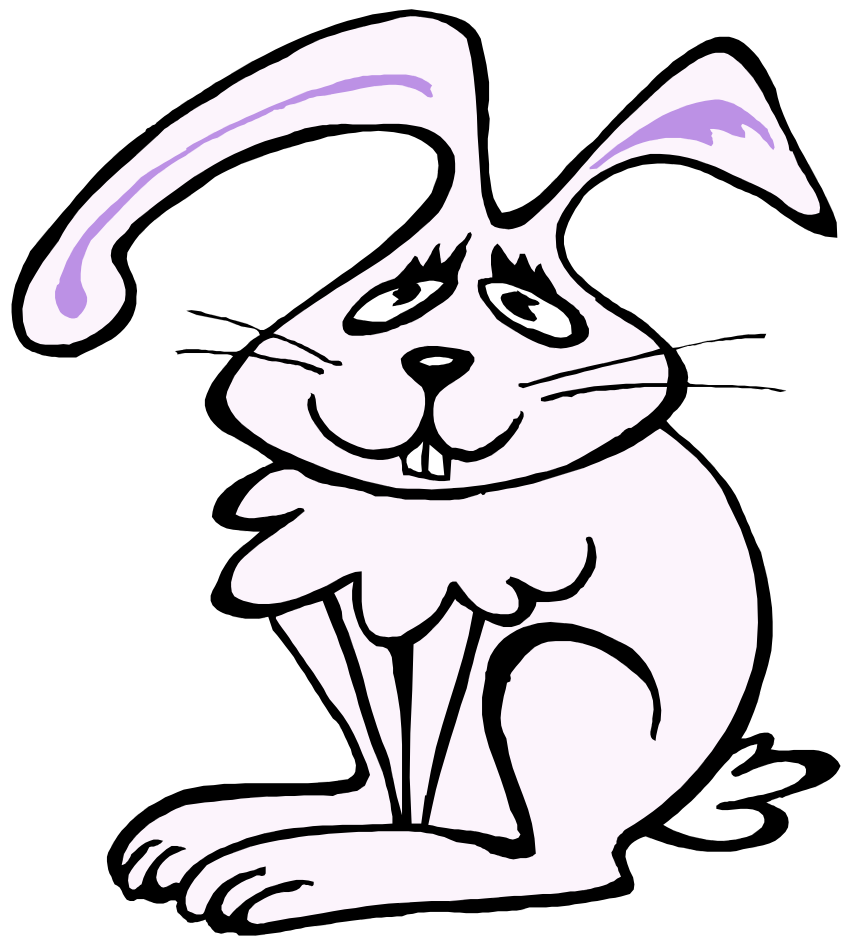
Performance:

As the bird (AO-27) comes over the horizon, I hear the tell-tale signs of FM quieting. By 5 degrees above the horizon I can make out about 50 percent of the in-and-out audio. By 10 degrees above the horizon, the signal is strong and by 15 degrees it is full quieting. In terms of comparison, I get full-quieting at about 5 degrees with my Arrow Antenna.

I can also confirm (again) the polarization of choice for AO-27 is vertical. At times, a slight tilt of the antenna improves reception, but placing it horizontal completely obscures the signal.

This antenna makes a nice companion to the 2 meter vertical and can be used mobile, like I use it, or as a fairly light and compact backpacking setup.

(C) 2000, Gerald R. Brown,
K5OE



Happy Easter

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

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

Radio Amateurs do it with more frequency!

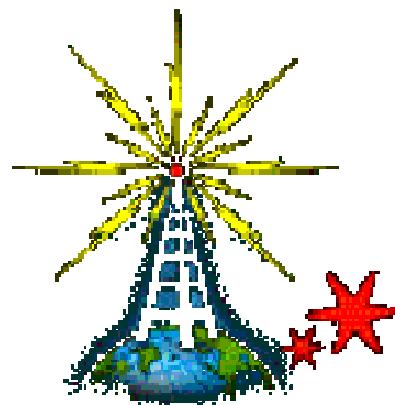
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West Rand members - we need your input!

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 this year. 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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