Alliance Amateur Radio Club

Affiliated with the "American Radio Relay League"

SPECIAL SERVICE CLUB

ZERO BEAT

October 1990

NEW DXCC COUNTRY ?

Have you worked an MA thru MZ callsign ? Well just in case you have, or in case you do in the future, don't get excited. They're only G's with a new prefix. The British have exhausted the entire G callsign block and are now issuing MA thru MZ prefixes. Just when I thought the US had the most screwed up callsigns, the Russians came along. Now the British are joining in.

The number following the prefix identifies the geographic location.

2 England
3 Scotland
4 Wales
5 North Ireland
6 Isle of Man
7 Jersey
8 Guernsey

Alliance Gets New Ham Radio Antennas !

Submitted by Dan Mutigli, N8LVO

The first of four Ringo Ranger 2-meter antennas was installed in August at the National Guard Armory on West Vine Street. Larry Ashburn, KE8VE and Larry Hillier, N8EWV did the drilling and installation of the antenna which is located on the southwest side of the armory.

Plans are to install the other three antenna at the Mount Union Fire Station, the downtown Fire Station, on the old City Savings Building downtown. The antennas, feedline and incidental supplies were paid for by the city. The estimated cost was around $700.

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The next meeting of the Alliance Amateur Radio Club will be held on Thursday, 4 October 1990. Meetings are held monthly at the Alliance Community Hospital at 7:30 PM in the cafeteria on the first floor. Visitors are always welcome.

CALLS

The latest calls as of September 1st 1990, are as follows:

EXTRA -- AA8CC (+5)

ADVANCED -- KF8JD (+15)

TECH/GENERAL -- N8MWQ (+66)

NOVICE -- KB8KPK (+27)

August was the worst month in three years for new novice licenses issued.

NET SCHEDULE

Eastern Stark County News and Information Net. Net Schedule October 1990

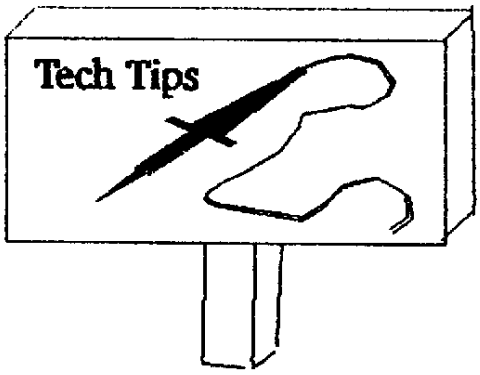
4 No Net - Club Meeting Night

11 N8DZA Jim Ferguson

18 KC3CL Dave Buckwalter

25 WX8G John Myers

Remember, if you cannot be net control on the night you are scheduled please let Pam N8IAK know. She can be reached at 821-5513(e) or 821-6545(d)



Well here it is. The final installment of the W1JR antenna symposium. Following this issue, the Zero Beat will begin to feature antenna construction articles. After all winter is comming, and that is when the best antenna work is accomplished.

The spectrum above 50 MHz has special significance to the development of antennas and antenna arrays. This is the frequency range where you can build a really high gain antenna without owning a large piece of real estate. It is also the region where antennas can be tested easily in preparation for scaling them to the HF region. At the upper end of our frequency spectrum the antennas are more aking to optics. I'll divide this segment of the spectrum into two parts, the VHF and UHF regions.

The two major types of antennas used in the VHF spectrum (50 to 225 MHz) are the collinear array and the Yagi structure. The collinear array usually consists of a group of 1/2 wavelength dipoles in front of a screen or set of half wave reflectors. In the later case, it technically could be called an array of two element Yagis. The unique thing about the collinear is the simplicity of the feed system which usually is an open wire line. The collinear is usually quite broadband, unlike most high gain antennas, and efficiency and gain can be quite high. The extended expanded collinear is a stretched out version that has less elements and was described in an article I wrote in Dec. '74 QST. Both the conventional and the extended expanded collinears were widely used in the days before good Yagi designs were available and are still in use by some 144 and 432 EME operators. This type of antenna has two main drawbacks: 1. It is large and hence it can be large enough, an expression the late Sam Harris, ex W1FZJ, used to use for antenna that couldn't stay up under adverse weather and 2. Its size usually prevents mounting other antennas on the same mast.

The workhorse in the VHF spectrum is truly the Yagi antenna. The first high gain VHF Yagi designs were published by Carl Greenblum (QST, Aug/Sept. '56), J. Kmosko, W2NLY and H. Johnson, W6QKI (QST, Jan. '56) and Dr. Hermann Ehrenspeck and H. Poehler (IEEE, PGAP, Oct. '59, pp 379-386). Unfortunately, these Yagis weren't always as good as claimed and had only fair cleanliness in the side lobe and front-to-back ratio. In Jan. '72 (QST pg 96 and March pg 101 corrections), Don Hilliard, W0EYE, now W0PW, published his 4.2-wavelength 15 element Yagi based on the unpublished works of Peter Biezbicke at NBS. Don and I urged Pete to publish his work and he finally did so in Dec. '77 in NBS Technical Note #688, now out of print. This publication was the result of extensive studies done by the NBS in the 1950's to develop high gain arrays for ionospheric scatter and included models with boomlengths of 0.4 to 4.2 wavelengths plus new information on scaling and boom corrections. In August 1977 "Ham Radio" I published a full length article on the NBS report including all the necessary details to build your own Yagis and sketched several models for 50 thru 432 MHz. There are some errors in the NBS publication which are corrected in my article. Not correct was the gain of the 2 element Yagi which should be approximately 5.0 dBd, not 2.6 as reported by NBS (they must have had some measurement errors). The NBS Yagis are not the only Yagi designs available but they are easily duplicated and near the maximum gain attainable for the

appropriate boom lengths. They have excellent patterns and are easily stacked for additional gain.

One more point in passing. The trigonal reflector system in NBS 688 definitely is no good on the 3.2 wavelength and shorter booms. It actually reduces gain by up to 1.5 dB! By lengthening all three elements in this reflector system, I have been able to recover all the gain but no real gain improvement over a single reflector. I have not tested the trigonal reflector on the 4.2 wavelength designs.

In Feb. 1978 QST, Wayne Overbeck, N6NB, published an antenna he named the Quagi. It is basically a Yagi using a quad driven element and reflector. It is low in cost using a wooden boom and fed directly with coax cable. DL9KR and others have done further optimization on the Quagi and have used arrays of 16 to do 432 MHz EME. This design could still use some optimization in gain and only a limited number of designs are available.

Other versions of the Yagi have also been used including the log-periodic fed Yagi developed by the late Oliver Swan and now manufactured by KLM (See Ham Radio, Jan '76, pg 46). The log periodic antenna discussed earlier in this talk has never found much favor with amateurs since there is no need for the bandwidth and it has less gain than a well designed Yagi. Along these lines, we can now make high gain Yagis with clean patterns using the NBS designs. These antennas seem to stack well in larger arrays yielding the 20 plus dBs required for 144 and 220 MHz EME. One EMEer, Dave Olean, K1WHS, is using an array of 24 of the 2.2 wavelength NBS type Yagis stacked 8 feet apart for EME and he has worked stations all over the world who are only using single Yagis and moderate power.

Most recently, with the help of a large computer, a special program and a local person interested in the design of VHF antennas, we were able to develop a very unique Yagi, an 8 element one on a 12 foot boom for 144 MHz that had extremely high gain (greater than 11.5 dBd true gain) with excellent pattern (all lobes down 20 dB). It worked so well that I made 8 copies and first tested them on a 144 MHz EME DXpedition to Rhose Island where 25 stations were worked off the Moon in two nights of operation. Computers will undoubtedly be useful in the future as this work continues.

UHF:

The 420 MHz and up area is in a transisition region. Long Yagi antennas can be made with high gain such as the NBS and Guenter Hoch, DL6WU, types. The later designs are an extension of the Greenblum designs mentioned earlier and can be designed up to 20 wavelengths (see VHF Communications, #3 and #4, 1977, and #3, 1982). These designs show an increasing gain of approximately 2.2 dB for every doubling of the boom length which is about the maximum so far reported. Indeed I built a 9.25 wavelength (21 foot) 432 MHz Yagi using this design material and achieved a verified gain of almost 17 dBd at the 1981 Central States VHF Conference in Sioux Falls, SD.

Long backfire ("A New Method For Obtaining Maximum Gain from Yagi Antennas", IEEE, PGAP, Vol 7, Oct. '59) antennas have been tried by the EMEers but gains have failed to live up to claims. The short backfire ("The Short- Backfire Antenna", H. W. Ehrenspeck, Proc IEEE, Vol 53, Aug '65) has been duplicated by myself and others and gains of approximately 15 dBi have been achieved. Perhaps more work should be done in this area as an array of short backfire antennas has the potential of higher gain

without the problems of the surface tolerances on the parabolic reflector.

Loop Yagi: Another popular UHF antenna is the loop Yagi developed in 1974 by Mike Walters, G3JVL (Radio Communications, RSGB, Jan '75 and Sept '78). Although it looks like a quad, it is distinctly different in that it uses wide but thin metal scraps for elements. Mike started out with wires but could never achieve high gains (like discussed earlier on quads). He recons that the wide but thin strap improves bandwidth and hence gain. The loops are bolted directly to a metallic boom thus solving the mechanical problems of mounting elements at UHF. It is a very practical antenna for 902 MHz and above and has worked well for me on 902, 1296 and 2304 MHz. G3JVL has even designed and tested to specifications a 10 GHz model. The principle designs use 26, 38 and 45 elements. The gain on the 45 element model (which is 16 wavelengths long) is 21 dBi! G3JVL has also published correction factors so that the loop width thickness and boom size can be scaled.

Dishes: There is something esoteric about the parabolic dish antenna. It just has to work but the typical dish only has a 55% efficiency at best. Furthermore, it has a large wind surface. Therefore, it is not too popular except at frequencies where loop Yagis are no longer economical and for EME where it can often be mounted close to the ground. More on this subject later.

High Performance Arrays: I'd now like to turn to the subject of high performance arrays and more specifically EME (Earth-Moon-Earth) antennas. EME affords a unique property, viz. that due to the approximately 2-1/2 seconds it takes a radio wave to traverse the 450,000 mile path to the Moon and back, the EMEer can make improvements to his antenna system and actually hear the difference by listening for his own echos. Furthermore, EME antennas have such high gain (typically greater that 20 dBi) that you can listen to the noise generated by the sun to measure beamwidth, patterns and hence determine actual antenna gain (see "Requirements and Recommendations for 70-cm EME", J. Reisert, W1JR, Ham Radio, June '82) as well as system noise figure.

Large Yagi arrays are becoming increasingly popular especially for EME. WB0TEM has 24 5.75 wavelength 19 element Yagis on 432 while K1WHS has 24 14 element 2.2 wavelength Yagis on 144 MHz. Both stations have big signals and are able to work small (1 or 2 Yagi) stations off the Moon.

However, the really big EME stations use parabolic dishes up to 40 feet in diameter! The advantages of a dish for EME operation are numberous despite the low (55%) efficiency (some commercial antenna manufacturers have claimed up to 80% efficiency but use cassegranian feed systems that are quite complex). First off, the feed system can be changed to permit multiband EME. Circular polarization is also possible by using dual dipole feeds or the W2IMU multimode horn. Dish type antennas are usually much quieter on reception because of low side lobes and hence are very desireable with the low sky temperatures experienced on 432 MHz and above. On 432 MHz where linear polarization is still predominant, the most efficient dishes are using the EIA symmetrical "E" and "H" plans and works well with a dish with a 0.45 to 0.5 F/ D ratio. VE7BBG has such a feed with a W2IMU horn built into the center and has made cross band (23 to 70 cm) EME QSO's. A single dipole in front of a splasher plate is definitely not recommended due to its unequal "E" and "H" beamwidths! We still have a long way to go to improve efficiency and the offset parabola recently introduced to EMEers by W2IMU from Bell Labs has considerable advantages if the construction can become feasible for amateurs.

Summary: The VHF/UHF frequency region is a good test bed for developing and improving antennas. Recent developments in the Yagi and loop Yagi have greatly advanced the state of the art in VHF/UHF communications. Antenna patterns have improved and hence the noise temperature of the antennas used is now more compatible with the state of the art preamplifiers. The NBS Yagi data now gives everyone interested a recipe for a suitable antenna without guesswork. EME antennas have taken a big leap forward in performance and made EME operation almost commonplace. We still need to do more work in the area of low loss feed systems especially for Yagi arrays.

The antennas will be used by local hams in conjunction with public officials and disaster coordinators in the event of an emergency.

If any club members are interested in assisting in completing the project, or getting involved with the Amateur Radio Emergency Service (ARES) contact Larry KE8VE.

Only 80 Shopping Days 'Til Christmas

And Only 71 Days 'Till the AARC Christmas Party

The AARC Xmas Party will be held on December 15th. Plan on attending this years festive event. Watch for further notices.

The Amateur's Code

ONE

The Amateur is Considerate. . . He never knowingly uses the air in such a way as to lessen the pleasure of others.

TWO

The Amateur is Loyal. . . He offers his loyalty, encouragement and support to his fellow radio amateurs, his local club and to the American Radio Relay League, through which Amateur Radio is represented.

THREE

The Amateur is Progressive. . . He keeps his station abreast of science. It is well-built and efficient. His operating practice is above reproach.

FOUR

The Amateur is Friendly. . . Slow and patient sending when requested, friendly advice and counsel to the beginner, kindly assistance, cooperation and consideration for the interests of others; these are marks of the amateur spirit.

FIVE

The Amateur is Balanced. . . Radio is his hobby. He never allows it to interfere with any of the duties he owes to his home, his job, his school, or his community.

SIX

The Amateur is Patriotic. . . His knowledge and his station are always ready for the service of his country and his community.

— PAUL M. SEGAL

PRINCIPLES OF AMATEUR RADIO

The Amateur Radio Service is a voluntary, disciplined communications service guided by five traditional objectives:

1. To provide emergency or public service communications when normal communications are disrupted.

2. To advance the state of the art.

3. To improve individual skills in radio operation.

4. To provide a reserve pool of qualified radio operators and technicians.

5. To promote international goodwill.

Amateur Radio began with a few experiments in the early 1900's and has since grown to over 420,000 licensed operators in the U.S. alone.

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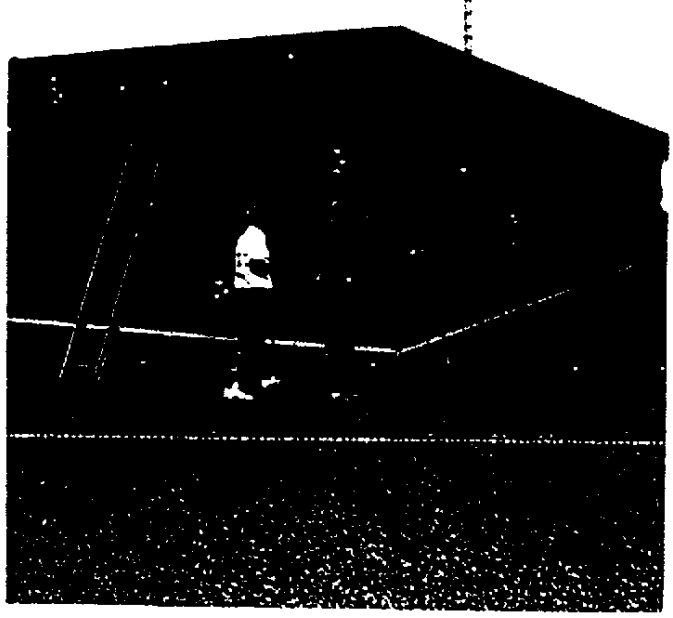

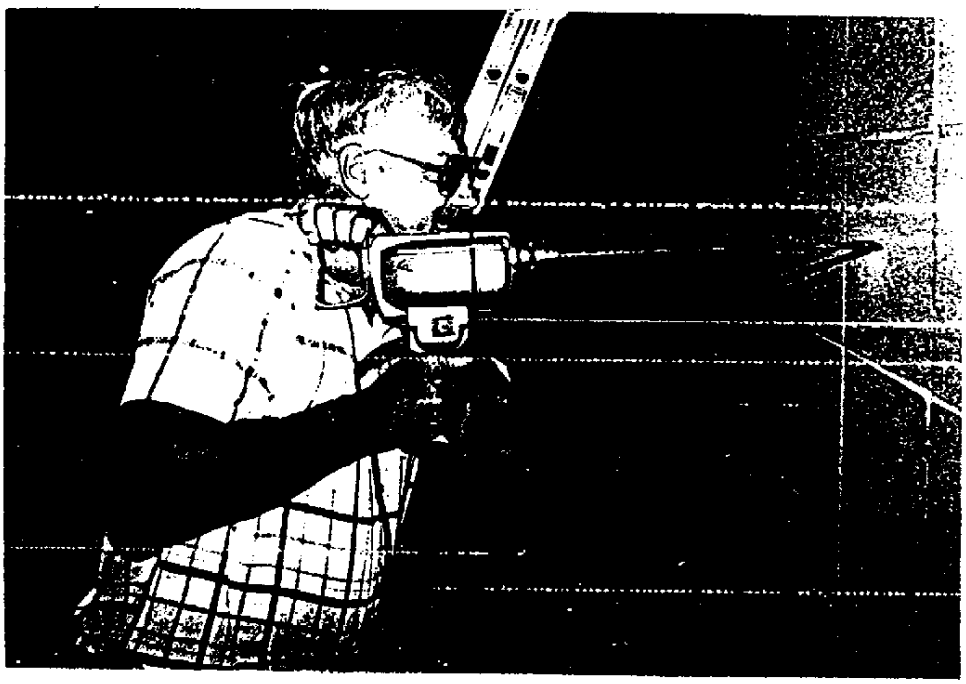

10/28 Mw Fox Hunt
Rptr - Auto-dial
JOTA
Stk Co Clubs
Mall show Apr 15-16

N8NZO Teletype Mail Box

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PM
3 OCT
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