Vol. 12 No. 1 **www.ceitron.com/mvus/mvus.html/** January 1998

January Meeting: Friday, the **23rd**, at 7:30 PM in the basement of the Huntington Bank in Springboro. Intersection of SRs 73 & 741. Meeting topic: TBD + Discussion of converting 800 MHz cellular units to 900 MHz ham use. (The club recently acquired a bunch of discontinued analog cellular units, including mobile high power types.)

Contents

Upcoming Events:

DARA Home-brew Night **16 Jan**

ARRL January VHF Sweepstakes **17...19 Jan** see QST/Dec97, pg. 104

Southeastern VHF- Conference in **Atlanta. 3....4 April**
See: www.acorn.net/~aebe/svhfs

Hamvention: 15, 16, 17 May

De N8ZM

Well, the first order of business this month is to wish all of you a happy and prosperous 1998, and the best possible propagation above 50 MHz. The second order of business is to thank all of you for supporting the Society in 1997, and to remind you that it is once again time to check the address label to make sure your dues are paid up for this year. As it is, the dues barely cover the cost of printing and mailing this newsletter each month, even with the effort Gerd puts into delivering some of them personally to save on postage. So if the label date shows 97, then please get your money to Gerd soon. Thanks also to Gerd and Bob, N8EHA, for all the hard work they do every month getting the newsletter together and mailed out to you. I get a little glory and a page to use to indulge my editorial whims, but the real work is the result of the hard work and dedication of those two. Thanks, guys!

We know have a web page up for MVUS, courtesy of Steve Coy, KC8UHY. It will typically carry page two of the newsletter (the index and meeting notice page), as well as a feature article from the latest issue. The intent is to use the web page as a way to attract attention to VHF/UHF operation and the MVUS. Gerd has the address elsewhere in this issue. Thanks to Steve for his efforts and support of MVUS.

The Holiday Dinner Party was a big success as it was very well attended and everyone enjoyed the opportunity to chat. The restaurant was very accommodating of our needs and, to my knowledge, everyone was satisfied with the service. For desert everybody got a cookie courtesy of the club (cheaper by the dozen, hi) .

Merle, W9LCE, and Red, W8ULC, are working together on the VHF Forum for the 1998 HamVention and have already lined up a fine program of first class presentations. While there are numerous changes being made in the overall forum schedule for this coming year, we appear to have been fortunate to have held on to both the forum and our Saturday morning time slot. Plan to check this one out and show the HamVention folks the level of interest that exists for VHF/UHF activities.

Bob French, N8EHA, and Garry Hollenbaugh, WB8YSE, have made available some 800 MHz gear which has the potential to be converted to the 900 MHz ham band. This equipment is very recent vintage and in very good condition. Our plan is to determine exactly what is needed to perform the conversion and then make the mods ourselves in order to be able to sell these units already converted. We think that there is a better market for these rigs if we do it this way, since many folks just don't want to take the time to deal with parts chasing, surface mount technology, etc. Also, we expect that there is a small investment in manuals and software that most folks wouldn't want to make. As we are able to learn more details about the convertibility of these radios, we will have a better idea of the feasibility of the project. If we can do it, MVUS will make a few bucks and a number of hams will have capability on 900 MHz. More later.

Til next month...73, N8ZM._

Books Available

Micowave Update 97 Proceedings $ 13.- post paid from Tom Whitted, WA8WZG, 4641 Port Clinton E Rd. Port Clinton OH 43452

UHF-Compendium Part 1&2 or Part 3&4 $ 29.-ea postage paid from Gerd Schrick, WB8IFM, 4741 Harlou Dr. Dayton OH 45432.

Leaving Town: Randy, WB8ART, our premier Dayton EMEer is leavig for Denver, CO. He still has a few items **For Sale: 4 Boomers, Elevation Rotor & lots of free "stuff" (junk).** (937) 294-1157

Check your label: (dues $ 8.- per year !)

This and That

The New QEX is a winner. It is now thicker and published bimonthly, it also has color cover photographs. The Jan/Feb 98 issue has 5 articles: The Car-As a Contoured Groundplane; Parabolic Dish Feeds-Performance Analysis and others. It's well worth subscribing.

Catch 22 of Computer Manuals. They are easy to understand if you already know what you are doing. However, turning to a manual for help is like asking a pig to explain mud! [Bill Husted]

Accurate Timing. In 1765, John Harrison received the first half of the prize offered by the British Board of Longitude for building a clock accurate to 1/10 of a second per day and demonstrating that it could be used to find longitude accurately on a voyage to the West Indies. I was checking my "free running" GPS clock the other day and found it to be off on the order of 1 to 2 seconds per day. A more accurate wristwatch I have is off -1 second in 19 days; this is, by the way, a $ 10.- Radio Shack type.

Swaying Structure. Tall buildings are like free standing towers subject to swaying back and forth. The Petronas Towers of Kuala Lumpur in Malaysia derive their stiffness from special concrete and steel. The resulting oscillation is one in 9 seconds which is considered comfortable for its human inhabitants. [Scientific American 12-97]

Gigantic Foundation. Not counting the over 100 piles driven into the ground, to lay the 15' thick foundation mat for the above towers took two days of uninterrupted cement pouring with trucks arriving every 90 seconds. (13,200 cubic meters) [Scientific American 12-97]

Cold and Dry Weather. This is what you need for good propagation of mm waves. The current UK record for 47 GHz is 65 km. Sam, G4DDK thinks he can beat that: "Roll on some cold frosty weather and 47 GHz will really fly."

Plutonium Reactor. Plutonium 238 is used as the energy supply for the most efficient "battery". It is, of course, radio active and emits α particles (half life: 87 years). The heat generated is converted to electricity. For 1 gram of plutonium one gets about ½ W of power. The battery of the lunar module was powered that way, as were batteries for pace makers. Shielding for α particles is easy.

Invisible Antenna. Al Torres, KP4AQI already known for making radio frequencies visible (see the Sep. 97 newsletter) has now come up with the opposite. He is using a foil imprinted with elements made of Indium-Tin-Oxide which is conducting but optically transparent. Application is for something like "undercover" work where you could use an "invisible" car antenna.

Ice Storm. The recent ice storm in Canada reminded us that trees, power lines, and power poles all have their breaking point under the ponderous weight of ice. Poles have supported 11 tons of ice before snapping, while power lines have withstood 1,000 pounds. As our beams will usually survive, wire antennas do often break.

Miracle. " There are only two ways to live your life ... As though nothing is a miracle ... Or as though everything is a miracle ..." [Albert Einstein]

Latest Invention for people who want peace and quiet: a "phoneless cord". [Ann Landers]

Average Height of Man. Over the ages man got taller. One million years ago his height was 4'4". In 1710 it was 5'4", in 1921 5'6" and in 1997 5'7". By the year 2050 the average height is estimated to be 5'8". [Newsweek]

Never wrestle with a pig, you both get dirty but the pig likes it! [Internet]

Demise of the Little Sputnik

To commemorate the 40th anniversary of the launch of Sputnik a 1 : 3 scale model sputnik was released from the MIR spacestation on 3 November 1997. Expected to last on battery between 3 to 6 weeks it finally went silent on December 29th after close to 8 weeks. This little satellite was build in cooperation by students in Russia and France. The Russian team provided the spacecraft and the French team the beacon type transmitter with rf power of 100 mW on 145.820 MHz. On halfway decent orbits (elevation > 20 degrees) the signal was strong enough to be heard with an HTRD (handy talky rubber ducky), often inside buildings. It got a lot of new hams exited about space and satellites and "older hams" to reminisce about the old sputnik in 1957. If you heard the "beep, beep ..." of the "Little Sputnik" (also known as RS-17 or Sputnik 40) you might want to apply for a 6"x9" four color certificate from the French school by sending a QSL, a return envelope and two IRCs ($ 1.05 at the postoffice) to:

FR5KJ Radio Club
College Jules Reydellet
103 Rue de la Republique
97 489 Saint Denis Cedex
Reunion Island, France

Our Sun

The gravitational attraction of this medium size
star controls the orbits of the planets. A rotating nuclear furnace, mostly of hydrogen and helium it constantly emits energy. Periodically magnetic fields emerge from its surface in areas called sunspots, darker because they are less hot. The gravitational attraction of this medium size Associated with these disturbances, which may last for weeks, are arching streams of gas called prominences and brilliant regions called flares. Such activity affects Earth's magnetic field, its atmosphere, and possibly its climate. Maximum sunspot activity occurs during 11-year cycles: the most recent one peaked in 1990. The Period of Rotation is 25 days at the equator.
Diameter is 1,400.000 km.
Mass is 333,000 x that of Earth.
Temperature is 15,000,000C in core
and 5,500C at surface.

[National Geographic]

440 Corner Reflector and Handheld to work Repeater on board MIR

from the desk of W8DJY "Brownie"

I heard about the 440 repeater aboard the Mir space station. The input frequency is 435.750 MHz and the output frequency is 437.950 MHz with a PL-tone of 141.3 Hz.

Could I build a very inexpensive antenna that anyone could replicate which would with a 5 watt handheld, generate enough ERP, that could be received by the 440 repeater on board the MIR space station? YES, I built a small corner reflector, using design parameters out of John Kraus's book on antennas. The corner reflector is built out of a cardboard box which I covered with aluminum foil. A female BNC chassis connector was mounted near the center of the corner by punching a hole through the cardboard and the foil. A small piece of copper shim stock was used as illustrated which is used to make a ground connection between the foil and the BNC connector. A 300 ohm folded dipole is cut having a length of **33 cm.** Another **21.5 cm** length of 300 ohm twin-lead is cut to connect the folded dipole to the
BNC and the coax balun. The folded dipole is held in place by using fishing line as illustrated in the drawing. The total cost of this antenna could be as high as $ 3.00.

L = 49 cm. S = 40.5 cm. B = 14.5 cm.

This corner reflector antenna produces a nice clean pattern (very low sidelobes) and the gain should be close to 11 dBi. With a power input of 5 watts from a TH-79 handheld the ERP (effective radiated power) should be near 60 watts. One rather nice feature about this design is that it is very light weight. I can hold and point it to the sky with one hand while I hold my handheld with the other.

After a few unsuccessful attempts of making a contact through the Mir space station repeater, I was finally heard by a W2. I found a few local stations would dominate the repeater not letting weaker stations have access.

The idea of this inexpensive antenna using a hand held is to let new hams have a shot at working satellites with equipment they now have. Hopefully taking the mystery out of satellite communication.

The MIM Quad

By Niels Koch, DG2MIM

For many decades quad antennas have been used as outstanding dx antennas. They were first applied on short waves then at vhf/uhf and now they are advancing into the GHz range. In practical service the quad antenna proves again to be the queen of the dx antennas.

Given the popularity of the quad it is understandable that many different versions of the quad were developed to satisfy mechanical and/or electrical goals or constraints. Comparable to this is the number of explanations of how a quad works. I like to explain the functioning of a quad by using parallel line theory. Following this an optimum design can be selected. First a comment: Electromagnetic waves consist of interacting electrical and magnetic fields that are perpendicular to each other switching, of course, back and forth at the rate of the operating frequency! The electrical field is represented by voltage and the magnetic field by current.

We start with a parallel line which is an integer multiple of a wavelength long. ($n\lambda$) On one end we excite the line with radio energy and at the other end of the line we place a short. We obtain the well known standing wave pattern. (Fig.1) You can see that the electrical (voltage) and magnetic (current) fields are 90 degrees or $\pi/4$ out of phase and that after $\lambda/2$ the polarity is reversed. If you cross the wires at the point of zero volts you can maintain equal polarity along the entire length of the line. (Fig.2) And pulling the wires apart at the voltage maxima you arrive at the typical structure of a (stocked) quad. A single quad element is obtained by just using one $\lambda/2$ length of line. (Fig.3) As the conductors are spread from the feedpoint the impedance is increased and the voltage raised resulting in a better match to free space. (120 $\pi\ \Omega$) Considering all the different shapes that the quad element can take: square, polygon , circle, diamond the latter shape appears to be the best choice. The maximum voltage appears at the 90 degree corners of the diamond which combined with the large enclosed area facilitates an optimum transition into space (radiation).

A number of antennas were designed along those lines in the GHz range where they are small and therefore quick and easy to implement. Printed circuit material was used as a carrier. Thus the concept could be verified and the design optimized. The result was a quad antenna with several quad elements in phase similar to a stacked dipole array. (Fig,4) Each quad element contributes additional gain, however, without changing the fairly wide beam width of a single element (~50 degrees). In the stacking direction the beamwidth is divided by the number of elements employed: e.g. providing the expected 3dB gain when doubling the area by using more quad elements. The printed circuit material should, of course, have low losses at the operating frequency. The dielectric properties shrinks the antenna size. - Once suitable material is selected the optimum form of the "printed circuit" antenna can be determined to accommodate proper coupling to space and the desired feedpoint impedance.

Reflector: The flat sheet reflector placed $\lambda/4$ behind the antenna almost totally mirrors the wavefront coming from the antenna and combines it with the main radiation towards the front. Although at a distance of $\lambda/4$ the feed impedance is minimally altered by picking the proper size and distance it can be adjusted to result in exactly 50 Ω.

Directors. Yagi type elements in the direction of radiation will increase gain but also influence the feed impedance. This approach is often used and the resulting antennas are called quagis. The word is a contraction of quad and Yagi.

Symmetry: The feed point of the quad is symmetrical and the use of (unsymmetrical) coax might introduce a slight distortion of the radiation pattern which is caused by spurious radiation from the outside of the coax. This is usually minor (provided the match is good) and preferable to using a balun which might cause additional losses.

Following are patterns of commercially available antennas that have been named "**MIM**" quads: a 4 stacked quad is for 23 cm and a 8 stacked quad for 13 cm. Their horizontal pattern with a beamwidth of 52 degrees is virtually the same, the vertical lobes, however, differ: their beamwidths are 22 and 12 degrees. The SWR is less than 1.5:1 across 60 MHz at 23 cm and across 80 MHz at 13 cm. Size and weight of both antennas are the same: 16"x6"x1.6" and 1.8 lbs. Price range: $ 90.-

"Quadrifilar conical helical antenna with travelling-wave current distribution"

by Nakano H., Ikeda N. and Yamauchi J.
IEE Proceedings in Microwaves, Antennas and Propagation, Volume 144, No 1, February 1997.

Summary by Chris Hill, VK6KCH

The article describes how, rather than forming four helices around an imaginary cylinder, they can be formed around an imaginary cone; the pitch of the cone, and the pitch of the windings of the helices controls the radiation pattern. For example;

1. A winding pitch of 40 degrees, and a conical angle of zero (ie back to a cylinder again) gives the 'classical' end-fire coverage expected from a quadrifilar helix antenna, subtending down to about 30 to 40 degrees elevation.
2. A winding pitch of 40 degrees, but with a conical angle of only five degrees (a very gentle cone) broadens the pattern to almost perfect hemispherical coverage, subtending down to about 5 to 10 degrees elevation.
3. A winding pitch of 40 degrees, but with a conical angle of fifteen degrees broadens the pattern to more than hemispherical coverage, subtending down to about minus 20 degrees elevation; but with degraded front-to-back ratio in the reverse-polarised sense
4. (This one's quite interesting) A winding pitch of 60 degrees, yet keeping a cylindrical form, provides peaked gain towards the horizon (about 10 degrees elevation) at the expense of overhead... but about about 30 degrees, we can afford to lose up to 8 dB compared to the horizon.

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History of the Quad

In 1931 a group of US missionaries established radio station HCJB in Ecuador to broadcast on short-wave to the northern hemisphere. The station, located at high altitude in the Andes mountains of South America, started out from a stable with just 250 watts of power. Today HCJB is a BIG installation with powerful multiple transmitters and a collection of antennas.

In 1939 a new 10 kW transmitter was installed and power fed to a huge 4 element antenna for the 25m band. Signal reports received were very satisfying. However, due to the thin air at the high altitude corona developed at the tips of the elements. This effect was so powerful it could be seen and heard to 1500 feet away. Moreover, as legend has it, "chunks" of aluminum melted and fell off the ends of the elements. In any case, the new transmitter had to be shut down.

In the summer of 1942 one of the engineers, Clarence Moore, W9LZX took a bunch of engineering books along to a secluded vacation spot to brood over the antenna problem. He started by thinking of using folded dipoles, but then he spread the elements till they formed a rectangle: the quad was born. On returning to the station the new antenna was built including a reflector and without delay pressed into service. With trepidation the 10 kW transmitter was fired up and connected to the new antenna. However, this time there was no corona and the antenna was quiet even under damp weather conditions.

Later Moore applied for and was granted a patent (1951) for his antenna which he called quad. A copy of the patent on this page shows interesting details: Contrary to today's common version of a one λ circumference and $\lambda/4$ sides the patent describes a double loop with two λ circumference and 8 sides of $\lambda/4$ (fig.1) with the same current distribution on both loops. The patent also describes a rectangular version (fig.2), a circular version.(fig.3), a omni version (fig.5) and a beam version (fig.6).

Sources for this translation summary: DJ1XK, HB9YK and OE8AK (CQ-DL, 10,11 &12 of 97)

Correction

In the artickle on Big Ear in the Nov/Dec 97 newsletter by
Harry Kitchen are two errors:
Bob Dixon's call is **W8ERD**
and in the middle of the second paragraph it should read:
typically 3 scans in 3 days