

April/ May Meeting: Friday, 25APR97 at 7:30 PM. Meeting will be held at the basement meeting room of the Huntington Bank Building in downtown Springboro. Program this month; Antennas by John Kraus, W8JK.

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Upcoming Events

ARRL 432 Mhz Spring Sprints 30 APRIL
 ARRL 50 MHZ Spring Sprints 17/18 MAY
 Dayton Hamvention 16- 18 MAY
 Central States VHF Conference 24-26 JUL, Hot Springs AR
 (W5ZN ex-WB5IGF & WB5LUA, WWW.CSVHFS.ORG)

The Society has acquired a large quantity of **surplus Radar detectors** in various states of completion. These are similar to the ones we had a few years ago. We still can supply the old circuit diagram, however, most likely there have been changes to the circuit. The frontend is the same: all units have the horn antenna, Gunn and detector diodes, essential items for a Gunnplexer.

Description of items for sale:

- Regular size horn, Gunn & detector diodes, dual circuit board, no case_____ \$ 5.00
- Small horn, Gunn & detector diodes, single circuit board, no case_____ \$ 3.50
- Small horn, Gunn & detector diodes, no circuit board, no case_____ \$ 2.50

Items will be available at the fleamarket stands of Daun, N8ASB and Randy, KB8III. No.

Crunch Time

It is fast approaching the 4 weeks to HamVention mark, and there is a need to get several things resolved very soon, or we will not be able to make a good showing for the society, or the VHF fraternity in general.

There are still some slots available in the club booth to simply spend a few minutes talking with friends and folks who stop by with questions about VHF, etc. And to sign up some new members. Certainly, it is an opportunity to share project ideas, problem fixes, and operating experiences with others. And the amount of time and physical work involved is minimal. Please get in touch with Gerd or me to work out a time schedule.

While on the subject of HamVention, a couple of members will have flea market spaces this year, and we hope to sell some radar detectors and 4-400 amplifiers. Actually, I'd rather sell the amps before the show, for pickup during that weekend. I really don't want to burden anyone with the task of lugging more than one of those critters to the flea market to use as an example. We have sold several so far (copies of the manual are included), but there are about 8 or 9 remaining that I believe deserve a good home. These things would be dynamite on 6 or 10 meters, and are very, very well built. I don't mean that in the battleship sense, but these are a quality design and have many nice features. Safety features for both personnel and equipment are a nice touch not often found on homebrew gear. For 150 bucks, you can hardly go wrong. As these were pulled out of commercial service, the condition of the tubes is unknown, but the 4-400A has a dissipation rating of 400 watts, and these amps were used in class C service putting out from 150 to 330 watts, intermittent duty. Other than age, the tubes probably haven't been abused. The latest price for a new tube is around \$190, so the amp plus tube for \$150 is a great deal. Even if you had to buy a new tube, you're still running 500 to 700 watts SSB for less than \$350! You couldn't build anything for that price unless you have a VERY well stocked junk box! If you are interested, call me. We have even been known to make deliveries within reasonable distances.

Also, we still have some radar detectors available in various states of assembly. Some are essentially ready to plug in and use as X and Ku band mobile monitor receivers. If you are interested in just the Gunn and mixer diodes, we have loose parts and assemblies, for your homebrewing pleasure. Contact Gerd or me to work out the details.

At the risk of being accused of developing an over-active admiration for John Kraus, W8JK, (if you were at the last meeting, you know what I mean) part of the program for the April meeting will be a video of a Kraus lecture on antennas given at Ohio State University many years ago. It is a classic example of how to communicate a complex subject in a plain and understandable manner. The demos he uses are simple and powerful. I think you'll enjoy it.

I saw in QST this month that Rutland Arrays has been purchased by C3I, a company owned by Owen Wormser, K6LEW. The new Sales Manager is Terry Price, WD8ISK, who most of you know as one of the more accomplished VHF contesters around. Terry played an important role in getting the Midwest VHF/UHF Society off the ground, and frequently entertained and enlightened us with his presentations on the techniques of successful contesting. Congratulations and good luck, Terry.

There will not be a May meeting of the society as our normal meeting night is the start of the Memorial Day weekend. See you at HamVention, and in June. And it isn't any too soon to start planning for Central States and our annual Picnic!

....73, Tom, N8ZM

This and That

On Lightning. 2,000 thunderstorms are raging on earth (average) at any given time. The southern hemisphere and Africa are the hotbeds. There are 100 strikes from clouds to the ground every second which adds up to 8 million per day. The danger to forests is not as great as could be. Nevertheless there are 10,000 fires per year in the US.

Ionospheric Charge. At 40 miles up the ionosphere is charged positive to 300 kV. This gives the earth a positive charge of one million Coulombs. This charge would dissipate (through leakage) in about one hour if it was not continuously refreshed and maintained by thunderstorms providing 2,000 amps charging current. (above items from "Understanding Lightning" by Martin Uman, 1971)

Never Mind. You can listen to thunder and tell how close you came to getting hit. If you don't hear it, you got hit, so never mind! (fifth graders Internet Humor)

Generation Gaps. If you are over 70 years old you probably still know your military ID number by heart. People over 35 years know their Social Security number; people under 35 memorize their credit card numbers; and the little people under 15 know all the cable channel numbers. (in part from the "Data Bus")

Telephone Number. Richard, K2EVW passed along his telephone number for the club roster. He informs us that he was off the air for the last year because he took his crank up tower down and has not gotten the new 100'+ tower up yet. If you call him and happen to leave a message on his answering machine, do not be surprised if you do not hear from him. Richard is in the merchant marine and is gone for months at a time.

Heading out. The Pioneer 10 spacecraft, launched 25 years ago is leaving the solar system behind. Originally just meant to investigate Jupiter, the craft kept going to swing by the outer planets and provide valuable pictures and data. It is now the first piece of "hardware" originating from earth to leave our solar system. Radio contacts became very marginal and have been terminated as of 31st March. There is a plaque on board with pictures and symbols that would tell intelligent finders where the craft came from and what humans look like. (Deutsche Welle TV)

Time and Space. Time is nature's way of keeping everything from happening at once.- And space keeps things apart; as we learned in school: no two things can be in the same place at once.

Flasche. As in this country you can purchase boxes for shipping at the post offices in Germany. With the known German sense for thoroughness these boxes are available in extra large (XL), large (L), medium (M), small (S), extra (XS) and Flasche (F). Flasche = bottle !

LCD versus CRT. Is the good old CRT or Braun's tube on the way out? The LCD displays are certainly trying hard and they have a lot going for them. Consider the following comparison of 8" types.

	CRT	LCD	
Volume	9745cm ³	240cm ³	
Weight	5kg	.33kg	
Power	35W	3W	(Hewlett Packard)

P3d. The most powerful transmitter of the many on board P3d is the 70cm one with well over 200 W output. On the ground it is therefore feasible to employ an omnidirectional antenna. Combining this with a 2m uplink where power is readily available into another "omni", one could completely eliminate tracking on the ground. (DL6DBN calculation) One could call this the "brute force" satellite mode.

Nothings. Vacuums are nothings. We only mention them to let them know we know they are there. (5th grader wisdom)

Hamvention Schedule 16 -18 May 1997

---All Weekend---

Midwest VHF/UHF Society BOOTH And Fleamarket Space

Booth C-2 Fleamarket 1702 and 2183 (N8ASB and KB8III)

for a description of the goodies being offered see page two of this flyer

----Friday Evening --

VHF Weak Signal Group Banquet

Holiday Inn North on Wagoner Ford Road 7:00 to 11:00 PM

Cash Bar, Two Entree Dinner, Guest Speaker on VHF Activity,
Noise Figure Measurements, over 50 Prizes (two valued at \$ 300),

Tickets for the Evening \$ 29 ea. (limit 150)

Contact: Tom, WA8WZG

---Saturday Morning---

VHF-Forum in Room 5

**Moderators: Merle Rummel, W9LCE
and Bob French, N8EHA**

Schedule

9:00	Mike Suhar	WB8GXB	“Mars Global Explorer Experiment”
9:30	Kent Britain	WA5VJB	“NTMS Log Periodic Antenna”
10:00	Tom Whitted	WA8WZG	“Getting RF to the Antenna”
10:30	Joel Harrison	W5ZN	“Feedhorn Designs”
11:00	Gerd Schrick	WB8IFM	“Getting started on X-Band”
11:30	Ed Krome	W9EK	“Microwave Opportunities on P3d”

Mike Suhar, WB8GXB has enrolled in a radio propagation course sponsored by the Solar Terrestrial Dispatch (STD) and the University of Lethbridge, Alberta, Canada. The course material includes various daily reports on current solar conditions. The recent solar flare has generated many news reports. A bulletin concerning the media's interest in the April 7th event issued by STD is summarized below:

Placing the April 7th Solar Flare in Perspective

The Solar and Heliospheric Spacecraft (SOHO) is making it possible to obtain more information on the Sun. Some of this information is finding its way into the mainstream media. While this information is fantastic, the media can tend to blow it out of proportion. The SOHO spacecraft has not been in operation very long so this event was probably the largest it has observed. As the new solar cycle develops many more spectacular events will be observed. The following is a summary of a report by the Solar Terrestrial Dispatch.

The solar flare was classified as a class C6/3N event. C6 identifies the magnitude of the flare in soft x-rays. C6 is not that unusual or spectacular. It was very small compared to flares that will develop in the next 3 to 6 years. 3N identifies the optical size and brilliance of the flare. "3" is a large flare, but the "N" represents only normal or average brilliance. A size 4 flare is the largest optical flare rating.

X-rays are considered a more accurate indicator of the flare's true magnitude and potential influence on the Earth. This flare was rather minute based on it's classification. Over the next 3 to 6 years flares 100 to 1000 times more powerful can be expected.

This event was not out of the ordinary or likely to produce any serious impacts to the Earth. Only minor geomagnetic disturbances can be expected as compared to others that will occur on higher magnitude CMEs.

What few people realize is that solar flares themselves are not well correlated with the magnitude of interplanetary disturbances. These are called Coronal mass ejections (CME). Most solar flares do not produce disturbances that escape the Sun. A number of CMEs are not associated with flares at all. Some researchers argue that flares are not related to CMEs, but are distinct events. More research needs to be done in this area.

Available Tools and Source Information

The advent of the world wide web and easy access to the Internet has opened up a wide assortment of possibilities for amateurs and professionals alike. You can now obtain current (almost realtime) images of the Sun and the solar corona. A good source of information is at the WWW page for the Solar Data Analysis Center (SDAC) at: <http://umbra.gsfc.nasa.gov>

Current predictions and other information can be obtained from the Space Environment Center at: <http://www.sec.noaa.gov>

Information regarding current solar flux and geomagnetic data can also be found at: <http://solar.uleth.ca/solar>

For those nearer to Australia, a great deal of information is available from IPS Radio and Space Services in Australia at: <http://www.ips.oz.au>.

These are good starting points for finding information on the current state of the Sun.

For those with a real hunger for **REALTIME** information, a substantial software package is available for those with Windows 95 computer systems (and soon Windows 3.1 systems) that will haul down a huge amount of critical solar and geophysical information **IN REALTIME** over the Internet. All you need is a computer that can be connected to the Internet (whether via a modem and an Internet Service Provider, or a direct line). The software effectively turns your computer into a solar, geomagnetic, space and ionospheric "weather" analysis center. The same data is used by professional solar and space weather forecasters. You can observe the progress of solar flares, **AS THEY HAPPEN**, updated on-screen as frequently as you desire (up to once each minute). You can study the **CURRENT** state of the ionosphere, obtain current geomagnetic readings from up to 11 magnetic observatories world-wide, set up to 43 audible warnings providing you with exceptional "activity trapping" capabilities, track the current locations, sizes and shapes of active solar regions and coronal holes, and much more. We feel it is ideal for anyone who wants to stay on top of current conditions.

Details can be found at: <http://solar.uleth.ca/solar/www/swarm.html>

A HOMEBREW DIRECTIONAL COUPLER

by

S.J.P. Laube, WB8ZDF

In lieu of dropping big bucks on a new directional coupler, or lugging out at a hamfest and finding one that is not toast, a simple directional coupler can be built from odds and ends around the shack. It is relatively easy to build a directional coupler that works well up to several gigahertz by using transmission line. Two pieces of semi-rigid hardline are used. The cable is bent, apertures are cut in the sides by grinding away the outer cable sheath, and the cables are then butted together and soldered so that the dielectric makes contact. I use 0.085" or 0.141" diameter semi-rigid cable that is readily available. Often, short pieces can be purchased at flea markets with connectors already installed. It is important to find pieces without bends over several inches because semi-rigid cable is difficult to straighten. This is especially true if the cable has already been pre-formed to tight radius bends. The overall assembly I constructed is shown in figure 1, although you may choose to modify it for your particular need.

The meter movement can be replaced with terminals that connect to a multimeter for more sensitive readings.

A unit, using the techniques and dimensions discussed, was assembled and tested on a HP8510 network analyzer. Coupling attenuation at 1296 MHz was measured at 26.2 dB while the reverse port measured 46.7 dB. Thus resulting in (46.7-26.2) 20.5 dB directivity. This pegs the minimum SWR that can be measured to 1.2. This performance was at the worst point. The unit was swept from 450 to 2000 MHz with coupling gradually decreasing to -40 dB at 450 MHz.. If you have some semi-rigid cable lying around, consider building one next time you want to measure reflected power or check performance of an impedance match. Although I have not tried to make one at 3 cm yet, it should not be too difficult. Several directional couplers can be made to function over your favorite microwave ham bands and can be included in home-brew transverters to check antenna performance while the transmitter is in use. Good luck, and have fun building. Catch you on 432!

Once two pieces of semi rigid cable are produced, assembly is as follows. First, the cables are bent, so that they are parallel only for the desired aperture coupling length plus a little extra length for bends. Coupling aperture length determines the minimum and maximum frequency. For instance, a coupling aperture of 2" will work down to 100 MHz, but more RF power is required to generate enough coupled energy to operate a detector diode. The 2" aperture will operate up to approximately 3 GHz before resonant effects start to appear. Apertures are then cut by grinding the outer shielding side of each cable flat until the dielectric is exposed evenly. This is done for each cable, as shown in figure 2 for a single cable length.

The cable is bent over a dowel, and clamped into a vice. I then grind away the part showing in the vice until a nice even exposure of dielectric is made, creating a flat spot on the cable. Another possible way to remove the cable outer shield in this fashion is to place the preformed cable on a vibrating sander. In any case, be sure to check the cable frequently, as even small bends in the cable can cause uneven removal of shielding and consequential uneven dielectric exposure.

I make two of these and then clamp one end together while soldering the other end. The bigger the aperture exposed, the less coupling loss. Unfortunately, this exposure of dielectric also alters the characteristic impedance of the cable, so the aperture width must be kept diametrically thin. For instance, air dielectric cable with a slot cut in the side has an approximate impedance of :
where D and d are outer diameter and inner diameter, and O is the angular aperture section in radians, as shown in figure 3:

The second term of the equation remains negligible for small angular sections. Extremely small angles will not couple enough energy to detect, and large angles will disturb the cable's characteristic impedance, so a tradeoff is in order. Angles in the range of 10° to 20° usually couple enough energy to operate a sensitive meter movement, while holding cable impedance to within a few ohms.

A detector diode can be any high speed mixer diode. The diode should be selected that will cover the range of frequencies the directional coupler is expected to work over. A simple circuit that contains a diode, matching resistor, and a bypass capacitor can be assembled in a small metal can and soldered shut.

The meter movement can be replaced with terminals that connect to a multimeter for more sensitive readings.

A unit, using the techniques and dimensions discussed, was assembled and tested on a HP8510 network analyzer. Coupling attenuation at 1296 MHz was measured at 26.2 dB and with reverse power applied it was 46.7 dB. Thus resulting in (46.7-26.2) 20.5 dB directivity. This pegs the minimum SWR that can be measured to 1.2. For other bands the data were: (attenuation/directivity all in dB), 6m: 47/28, 2m: 41/29, 220: 36/30, 432: 31/29, 902: 28/22, 2,000 MHz: 29/19. If you have some semi-rigid cable lying around, consider building one next time you want to measure reflected power or check performance of an impedance match. Although I have not tried to make one for 3 cm yet, it should not be too difficult. Several directional couplers can be made to function over your favorite microwave ham bands and can be included in home-brew transverters to check antenna performance while the transmitter is in use.

Good luck, and have fun building. Catch you on 432!

2m Turnstile

It is difficult to design a clean beam antenna with low side- and backlobes. Similar problems exist in designing an omnidirectional (hemispheric) antenna w/o holes in the pattern. This kind of pattern is needed to communicate with airplanes and low earth orbit (LEO) satellites. A simple quarterwave rod over ground, strangely called a "groundplane", has a very nice round horizontal pattern, but a big hole overhead. A horizontal dipole, less than $3/8 \lambda$ above ground, has a nice overhead coverage but does not do good close to the horizon and, of course, has a big hole on either side. By connecting up two dipoles in "turnstile" fashion we can in essence "rotate" the pattern thus eliminating the side holes. And by choosing a $3/8 \lambda$ distance to the reflecting ground the low angle radiation can be improved. An antenna placed above "real ground" is usually surrounded by numerous obstacles that ruin the characteristic, so in most cases an "artificial" ground is used and the antenna plus groundplane raised to put it in the clear.

Some time ago I built a 2m turnstile using a 4'x4' frame covered with wiremesh as a groundplane and I used it either directly on the ground or on top of a mast. Since this 4'x4' frame is rather cumbersome and the wiremesh, although mostly holes, still has considerable wind resistance a new design was tried.

Instead of the groundplane I decided to use two reflectors. Other considerations were the symmetry and impedance of the phasing- and feedlines. Working together with Klaus, DL7DU, who is quite versed with Brian Beezley's Yagi Optimizer program, we eventually settled on two design which are detailed below. So far I have built no.1.

the "Center Pieces"

Support 3.5" x 3.5" x 1/8"

Radiator s Teflon or PVC

Reflectors Aluminum

1/2" PVC end cap

for stacking use 1/2" PVC

elements 3/8 OD, 4-40 hardware

reflector length measured tip to tip

No. 1 (F)

Phasing Section

RG-58 $66 \lambda/4 = 13.4''$

1 1/2 " Floor Flange

short piece of 1 1/2" pipe, threaded

connects to 1 1/4" mast

No. 2 (G) Phasing Sections

RG-8 $\lambda/4 = 20.3''$

75Ω twinlead

Pawsey Balun

1 ea $.66 \lambda/4 = 13.4''$ 1 ea $.66 \frac{3}{4} \lambda = 20''$

These are connected to the individual dipoles, then paralleled. The resulting impedance is 37Ω , a tolerable SWR of 1.35 for a 50Ω cable. Use the "Pawsey Balun" to connect.

