MIDWEST VHF-UHF SOCIETY

Vol. 20 No. 3 **www.mvus.org** **Mar, 2006**

Club Memorial Call W8KSE 10 & 3.4 GHZ Beacon, presently in Repair.

Meeting at the Old Country Buffet ! near SR 725 and Yankee Rd. in Centerville

March Meeting on **Fri 24 March** 7:30 PM

MVUS Sunday Net

Our Sunday MVUS net is held every **Sunday at 14:30 GMT** (we stay on GMT year-round, so currently the net is at **9:30 AM** local time). The net frequencies are primarily **144.280 Mc and 28.960 Mc.**

Contents

Upcoming Events!

Next Microwave Activity Day: Sat 1April

10th Annual **Southeastern VHF Society Conference**
April 28th and 29th, 2006
Greenville, South Carolina

Hamvention……19, 20, 21 May, 2006

Microwave Update 2006, 20-22 Oct in **Dayton**, Ohio (see page 10)
See us at the Hamvention
The Midwest VHF/UHF Society. More details coming soon. Check the Internet.

De N8ZM

One of the really exciting aspects of the age we live in is the amount of information we have available about this planet and the other objects, which share space in our universe. I subscribe to an e-mail message service from NASA that provides a daily news blurb about space related happenings, and there is almost always something fascinating to read. One of the more recent has been a prediction by a highly credible scientist who studies solar activity. Mausumi Dikpati of the National Center for Atmospheric Research (NCAR) claims that although right now the sunspot count is exactly zero (well, OK, we ARE at the minimum), we should expect to see at the peak of this cycle possibly record high numbers of sunspots. She has studied the recorded history of sunspot counts, some 300 years worth, and observed some characteristics that she believes suggest that we are in for a pretty wild ride.

Dikpati's theory describes a conveyor in the Sun's atmosphere that transports the magnetic disturbances which are sunspots down to lower levels of the solar atmosphere where their energy is replenished, which then drives them back up to once again be visible. These conveyors have a transit time of some 40 to 50 years, apparently not synchronous with the 11-year sunspot cycle. Hence, the there is an apparent cyclical nature to the amplitude of the peaks of each cycle as well. The last big peak was in 1958. The Northern lights were reportedly seen three times that year, in Mexico! The prediction is that the coming peak will be 30 to 50 % higher than the previous cycle's peak, and should occur in 2010 – 2011.

Could be an interesting time, as there will very likely be serious disruptions to the electronic systems that we are so dependent upon, but HF and VHF propagation should be just plain marvelous, except when massive solar flares wipe it out. Stay tuned!

On a more Earthly note, we had a MUD 2006 Committee meeting a few nights ago, and I want to start by thanking all of the folks who took time to attend. After wandering in the desert a bit for the first few months, things are really starting to fall into place, and we are getting more volunteers stepping up and plans are starting to gel. Thanks to all of you. We still could use a few more volunteers, so don't wait for me to track you down; let me know if you would like help!

One of our early efforts to publicize the conference will be at Hamvention in May. We have requested an additional booth space adjacent to the MVUS booth, to use to publicize the conference, and will offer to let representatives from other clubs interested in VHF and microwave activities have a place to promote their own organizations as well as MUD-2006. We believe this will provide greater exposure for the VHF/microwave aspects of ham radio, and hopefully attract some new faces to the ranks of those active with 'weak signals' above 50 MHZ. Bob Mathews, K8TQK, is helping with getting the word out about this opportunity, and promoting MUD-2006 in general. Bob is a well-known VHF contester, and brings a lot of insight and knowledge to this task.

Speaking of Hamvention, we will need to get folks signed up for booth duty at the March meeting, including setup and teardown. Please consider spending some time supporting MVUS at the show. It is one of the best places for us to recruit new members and see old friends!

73, de Tom, N8ZM.

March Microwave Activity Days 3-4-06 By Lloyd, Ne8i

Heard and worked 7 active stations Saturday 3/4. K8MD EN82, K8EB EN73, K3SIW EN52, KB8U EN71, WA8RJF EN91, WA8VPD EN82 and myself, EN82. Beacons indicated basic dead band conditions. Tried several bands through 3456. One of the nice things about MAD is that you can take time to try things, and try them repeatedly which is not possible during a contest.

Next Microwave Activity Day: Saturday April 1, 2006.

This and That 3-06

- **Mad Mad Mad**. When you are mad, count to 10 before you talk, and when you are really mad count to 100! [Thomas Jefferson]

- **Dish for Laptop.** Hawkins Technology offers a dish to improve WiFi connection with laptops. Cost is $ 89. Four diodes indicate proper aiming and a "triple strength" signal is achieved. That would be a 5 dB improvement and the size of the dish would be a few inches! [WB8IFM]

- **Only One**. "I am only one, but I am one. I cannot do everything, but I will not let what I cannot do interfere with what I can do." [Edward Hale]

- **Intuitive Mind.** "The intuitive mind is a sacred gift and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift." [Albert Einstein]

- **Keep Focused**. "Things which matter most must never be at the mercy of things which matter least." [Goethe]

- **Conversion.** One million-million microphones? = One megaphone !

- **Intravenous Tubing.** 2.4 miles of intravenous tubing at Yale University Hospital? = one I.V. League

- **President's Day.** "Abraham Lincoln was known as "Honest Abe". And George Washington "couldn't tell a lie." Get it now? They were "Honest Politicians!" An extinct species! Like the Dinosaur and the Dodo Bird… They are GONE!" [Mr, Wilson in "Dennis the Menace" by Hank Ketcham]]

- **Transistor Smell.** "I turned on the defroster in my 99 Ford Ranger with a 6-cylinder engine. It worked fine, but there was an odor similar to a transistor burning." [J.G., Kill Devil, N.C.]

- **Cells?** "Wright-Pat to limit use of cells" read the headline in the paper! Makes you wonder why we do not call our "radios" rads! [Gerd, WB8IFM]

- **Onion.** "The owner of today's advanced autos can be confronted with an array of electronic menus that must be peeled like an onion to perform even the simplest task." [Royal Ford]

- **Error**. "If a man is in a hurry to give up an error, he is liable to give up some truth with it." [Wilbur Wright]

- **The Truth.** "If we all worked on the assumption that what is accepted as true is really true, there would be little hope of advance." [Orville Wright]

- **Digital Disadvantage.** WMUB, the public radio station in Oxford, Ohio, is now transmitting a digital signal along with the "old" analog FM signal. The analog transmitter puts out 9 kW, the digital transmitter, however, only 90 watts, or 1%. Similar discrepancies exist for the digital OTA (over the air) TV transmissions. Still reception of the digital signals are often quite acceptable. Because of digital processin there is a power advantage, although not by a factor of 100, or 20dB, or 4 S-units. The reason for the low power: digital transmitters are quite expensive and the stations save on the power amplifiers, they have to 2009 before the complete switch to digital. [WB8IFM]

- **Digital Advantage**. Early cellphones were using up to three Watts of transmit power; now they are using often just milliwatts, a tremendous improvement made possible by digital processing! [WB8IFM]

Slot Antenna Design from the old Brian Yee WEB page

By Stephen Bell, KB7TRZ

This paper was presented at the 40th Annual West Coast VHF/UHF Conference held on May 5-7 (1995?) in Cerritos, CA. Some editing was done to make it suitable for this WEB page.

Abstract

Slot antennas can be used for fixed stations, satellite ground stations and beacons. With proper mounting, a slot antenna can also be used for 'microwave mobile'. With a 16-slot total, the antenna can have 10-12 dBi gain.

Slot antennas can be built from surplus waveguide sections, which will give an omni-directional pattern and horizontal polarization. This paper offers a computer aided method to calculate the proper dimensions for the slots and their locations.

Because the antenna is of one-piece construction, it is rugged and can be built cheaply, requiring only access to a reasonably precise drill press or milling machine. (Note: A precise milling machine is almost a necessity…de W3RJW)

Getting Ready

The first step in construction of the antenna is to select a section of waveguide, which covers the desired frequency. Waveguide dimensions for several microwave bands are listed in table 1. If your waveguide doesn't match the dimensions exactly, go ahead and run the program. The program will tell you if the waveguide is too small (if you attempt to operate a waveguide below its cutoff frequency, it will have unacceptable SWR and losses)

TABLE 1. Waveguide Dimensions

Usable Frequency (GHz)	Typical Waveguide	Long Dimension "a" Inches	Short Dimension "b" Inches
1.12-1.7	WR650	6.500	3.250
1.7-2.6	WR430	4.300	2.150
2.2-2.3	WR340	3.400	1.700
2.6-3.95	WR284	2.840	1.340
3.3-4.9	WR229	2.290	1.145
3.95-5.85	WR187	1.870	.0870
4.9-7.05	WR159	1.590	.0759
7-11	WR102	1.020	0.510
8.2-12.4	WR90	0.900	0.400
10-15	WR75	0.750	0.375
18-26.5	WR42	0.420	0.170

Running the Computer Aided Design File

Once the waveguide has been selected, just enter its cross-sectional dimensions and the desired operating frequency into MathCad program file *slot_ant.mcd or slot_a2.mcd. In order to edit the file and make the calculations, you must have a copy of MathCad running under MS Windows.

The program file references the slot antenna dimensions shown in Figure 1. Note that all calculated dimensions (from the MathCad program) are given in both inches and millimeters. For the best pattern, a pair of ground planes (wings) can be added to either side of the antenna. The 'wings' should be flush with the top of the waveguide and extend at least a half wavelength below the bottom slot. The wings need to protrude out from the sides by several wavelengths, if possible.

Machining the Slots

Drill Press - "Just" drill many overlapping holes, then file out the slots to the desired dimensions.

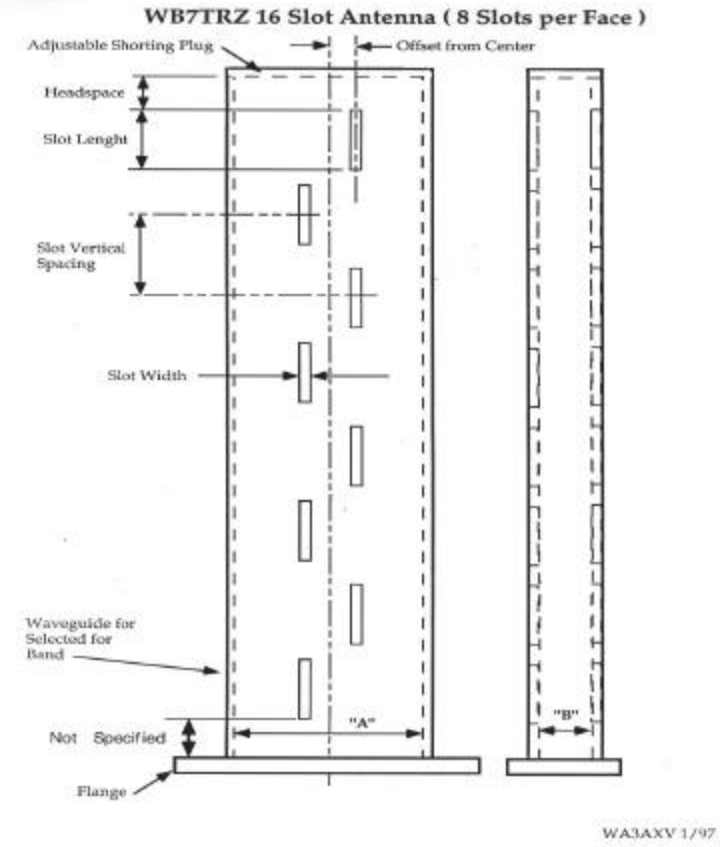
Milling Machine – The ideal method: fast and accurate, less prone to mistakes.

Note: The front face and rear face slots are exactly across the waveguide from each other. You should be able to 'see through' any front/back pair of slots.

Feeding the Antenna

The simplest feed for the slot antenna is to use a coaxial to waveguide transition. These transitions are often available on the surplus market. (Note: Another method is build the antenna long on the bottom and use a N chassis mount jack and probe antenna to replicate a transition as part of the antenna …de W3RJW)

FIGURE 1. Front View of Waveguide Slot Antenna



MathCad Software

There are two versions of the MathCad slot antenna program. It was discovered that the original program running on MathCad 3.1 had some problems when users tried to run it on later versions, namely Version 6.0, etc. For users of the older MathCad, use *slot_ant.mcd, otherwise use slot_a2.mcd. Many thanks to Steve Muther, WF6R, for getting the program running in MathCad 6.0.

Ham Band Slot Antennas

Here are some worked examples of waveguide slot antennas using the MathCad program by Stephen Bell. These examples are based on a **16-slot** design (8 slots per face). All dimensions are in inches.

Band (MHz)	Wave-Guide	"a" Dim.	"b" Dim.	Offset from Center	Slot Length	Slot Vert. Spacing	Slot width	Head Space
1296	WR650	6.50	3.25	0.49	4.46	6.39	0.64	6.39
2304	WR340	3.40	1.70	0.21	2.56	3.90	0.39	3.90
3456	WR284	2.84	1.34	0.31	1.71	2.57	0.26	2.57
3456	WR229	2.29	1.15	0.15	1.71	2.57	0.26	2.57
5760	WR187	1.87	0.87	0.25	1.02	1.23	0.12	1.23
5760	WR159	1.59	0.76	0.15	1.03	1.34	0.13	1.34
10368	WR102	1.02	0.51	0.14	0.57	0.69	0.07	0.69
10368	WR90	0.90	0.40	0.08	0.57	0.74	0.07	0.74
10368	WR75	0.75	0.38	0.05	0.57	0.88	0.09	0.88
24192	WR42	0.42	0.17	0.05	0.24	0.30	0.03	0.30

Below are several more antennas using the MathCad program. These are **32 slot** antennas (16 Slots per Face ... de W3RJW

Band (MHz)	Wave-Guide	"a" Dim.	"b" Dim.	Offset from Center	Slot Length	Slot Vert. Spacing	Slot width	Head Space
5760	WR159	1.59	0.76	0.103	1.025	1.341	0.134	1.341
10368	WR90	0.90	0.40	0.059	0.570	0.736	0.074	0.736

Below is an **8 Slot** design for 2304 MHz (4 Slots per Face) ...de W3RJW

Band (MHz)	Wave-Guide	"a" Dim.	"b" Dim.	Offset from Center	Slot Length	Slot Vert. Spacing	Slot width	Head Space
2304	WR340	3.40	1.70	0.296	2.563	3.901	0.390	3.901

** Brian Yee's home page no longer exists as far as I can tell. Likewise, the links to the programs are also gone. Here is a link to a basic program that purports to perform the same calculations as the MathCad program.*

http://www.ham-radio.com/sbms/sd/slotant.htm

Here is a Visual Basic program that calculates the Slot Antenna parameters. This program was sent to me by Peter, VK3KCG. Click here to download.

de W3RJW

Noise from the Stars

By Gerd Schrick, WB8IFM (7-86, Central States))

In the early 30s Karl Jansky was tasked by Bell Telephone to investigate atmospheric noise, which at that time with the growing HF overseas traffic played a big role in system performance. He found three types of noises: 1) set noise generated within the receiver, 2) atmospheric noise or static, and 3) a peculiar noise. First, this was believed to be interference, then as coming from the sun. But eventually it became clear by comparing measurements over a period of time that the noise was synchronized with star time, and thus for the first time noise from the stars was identified.

Jansky performed his experiments at 20 MHz, at which frequency we know now the atmospheric noise subsides and star noise appears. Not much attention was paid to Jansky's findings. However, in 1937 Grote Reber, W9GFZ, built a 30' dish and surveyed the sky at VHF frequencies and published the first "sky noise" maps.

In WW II the field of electronics developed by leaps and bounds, and after the war the time was ripe for the new field of "Radio Astronomy". No other than our John Kraus, W8JK, played a major role in the ensuing exploration of "radio space", and this radio branch is now considered "Queen of Astronomy".

The ideal antenna, switch and preamplifier generate no noise of its own. If it were not for external noise pickup, very little signal strength would be needed for communicating. Presently, at VHF, receiver systems are near ideal and sensitive enough to pick up limiting noise from the outside, either from the ground or atmosphere or from the stars. Rotating the beam through 360^0 will vary this noise usually by 10 dB.

At UHF and microwaves, however, the battle continues as the external noise drops dramatically and is not matched by a drop in the receiver system noise. Additionally the noise generated from the losses in the antenna, cable and relay contact, although low, becomes as important as receiver or LNA noise.

As to the noise from the stars: NASA has compiled "Sky Noise Maps" at two most interesting communication frequencies: 136 and 400MHz. These maps show the entire sky as seen from the earth with contour lines in ^{0}Kelvin, which is the preferred measure for noise at microwave frequencies.

In order to calculate the noise pickup from the sky, you have to integrate the temperatures over the coverage area of your antenna. The resultant temperature in ^{0}Kelvin is referred to as antenna temperature (TA). This represents the external noise that the signal, picked up by the same antenna position, has to overcome. However, as mentioned, additional noise is added by antenna losses, cable losses, switch losses, as well as internally generated receiver noise. Compared to the receiver noise (LNA), it becomes extremely important to minimize these losses. This requires a large low loss cable (hard-line), but better yet, the LNA should be mounted directly at the antenna. An antenna relay if needed, should be of extremely high quality (low loss, low SWR).

A typical calculation assuming an antenna temperature of Ta = 35^0K, a combined cable and relay loss of 1dB = 75^0K and a LNA of .5 dB = 35^0K adds up to a total noise of 145^0K. By moving the LNA directly to the antenna, 75^0K can be subtracted, which improves the signal to noise ratio by 2:1 or 3 dB.

Business and industry have opted to use dBs or ^{0}Kelvin, whatever sounds best, to describe their products, disregarding mathematics. Since all calculations leading up to the input of the preamp are additions, dBs make no sense, as they indicate only ratios of noise, ^{o}K need to be used. Here are the formulas to use to convert one into the other: **T**(^{0}K)=290(10expNF/10-1) **NF**(dB)=10lg(T/290+1)

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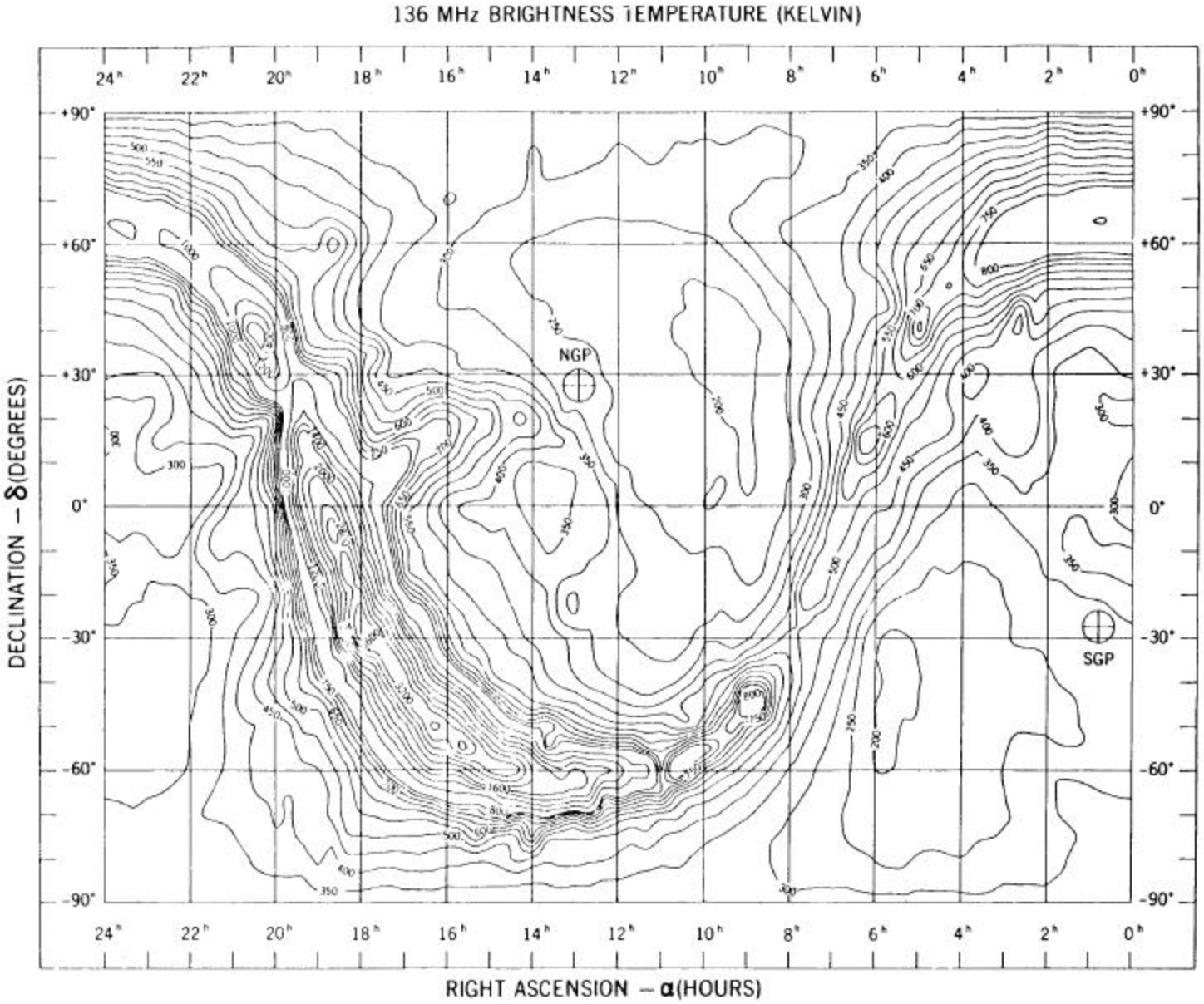
136 MHz BRIGHTNESS TEMPERATURE (KELVIN)
24h 22h 20h 18h 16h 14h 12h 10h 8h 6h 4h 2h 0h
+90° +60° +30° 0° -30° -60° -90°
NGP
SGP
DECLINATION – δ (DEGREES)
RIGHT ASCENSION – α (HOURS)

Call for Volunteers

We need help for the upcoming Hamvention (19,20,21 May), and for the Microwave Update Conference which will be held in Dayton for the first time this coming October. Below you find the present list of activities and volunteers for the Microwave Update Conference (Oct 06). We are still in need of more help in particular for the Hamvention where we are going to have a double booth to promote microwaves (MVUS) and the Microwave Update Conference.

Call for Papers

We invite you to submit a paper (initially just an outline or abstract will do) for the upcoming Microwave Update Conference. This can be anything related to the microwaves etc. This will be included in the "Proceedings" at a minimum and could be considered for a presentation at the conference, either to the full audience or as a posterboard session. If you have any questions or need help with the paper please contact us by mail or e-mail. (Tom, N8ZM; Gerd,WB8IFM or Bruce, Ni8E)

MUD-2006 Dayton (Oct 20, 21, 22 - 2006)

Over-All responsibility:	Tom	N8ZM	Tom_Holmes@agilent.com
Treasurer / Registration:	Gerd	WB8IFM	WB8IFM@AMSAT.org
Secretary	Bruce	Ni8E	BruceRaymond@ameritech.net
Presentations:	Red, (Gerd)	W8ULC WB8IFM	RedW8ULC@siscom.net WB8IFM@ARRL.net
Banquet:	Mike Sch	N8QHV	N8QHV@ARRL.net
Hospitality (after hours):	Red	W8ULC	RedW8ULC@siscom.net
Webpage:	Steve, (John)	K8UD N8UR	K8UD@ARRL.net JRA@febo.com
Antenna Measurements:	Daun	N8ASB	Daun@Yeagley.net
Network Analyzer, Noisefigure:	Tom	N8ZM	Tholms@woh.rr.com
Prizes	Emanuel Tom	WA8RJF WA8WZG	TonyE_kdi@sbcglobal.net WA8WZG@wa8wzg.com
Raffle	Red	W8ULC	RedW8ULC@siscom.net
Publicity	Bob	K8TQK	K8TQK@zoomnet.net
Surplus Tours	Mike M	KA8ABR	Murph@erinet.com

The April / May 2006 Anomalous Propagation Newsletter

The upcoming newsletter will have a lot of information in it for the Microwave Update Conference and we will print extra issues to be distributed at the Hamvention. So we invite you to think about items that should be considered for inclusion. Time is short, deadline for submission is Sat. 22nd of April!