MIDWEST VHF-UHF SOCIETY

Vol. 20 No. 7 **www.mvus.org** **September 2006**

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

Monthly Meeting Fri 22 Sept

MVUS Sunday Net at 14:30 GMT (currently at 9:30 **AM** local time, EDT). The net frequencies are primarily **144.280 Mc and 28.960 Mc.**

Contents

In October: Microwave Update 2006, 19-22 Oct in Dayton, Ohio

Where? Holiday Inn Dayton North, just north of downtown off I-75, exit 57B, Wagner Ford Rd. Tel 937-278-4871

Registration: Supply: Name, Call, Address, E-mail, Tel. And to 30 Sept $40, after Sept 30 $45, and at the door $50. Mail info + check (make out to the Midwest VHF/UHF Society) to Gerd Schrick, 4741 Harlou Dr Dayton OH 45432-1618.

Ladies Program

Through out the conference we have volunteer ladies standing by to advise and/or accompany groups to the various sites:

Local

Air Force Museum
Wright Bros Memorial Hill
& Interpretive Center
Dayton Art Institute
Riverscape (downtown)
Wegerzyn Garden Center
Cox Arboretum
Carillon Park
Sunwatch Indian Village
Wright/Dunbar National Park Museum
Fairfield Commons, Dayton Mall
The Green

Further out

Waynesville-- Antique shops
Springfield – Antique Malls (3)
Springfield – Frank Lloyd Wright Museum
Yellow Springs (Antioch)
Fort Ancient
Cincinnati

DE N8ZM:

As I write this, it is just one brief month until **Microwave Update 2006** begins. While there is still a lot of work to be done, things are moving along quite nicely. That isn't to say that we don't need your help to pull this off, however. As the event approaches, we will need to know that we can count on your help to keep the wheels turning. If you haven't yet signed up to help, go to the MUD website at www.microwaveupdate.org to see what is going on, then send me an e-mail at the **info@microwaveupdate.org** address on the web site telling me how you'd like to help. But please don't wait until the last minute. That doesn't help us put on a successful MUD, and you might miss out on a plum job at the show, like escorting Miss MUD 2006 to here seat at the banquet. WHAT? You've never heard of Miss MUD 2006? For your chance at this, you had better get registered so that you don't miss out. Do it today!

At this time, we have 51 people registered, including some of the best known names in microwave activity from around the US and several foreign countries. This promises to be an awesome party. The banquet speaker is Joel Harrison, W5ZN, current President of ARRL, and an accomplished microwave operator to boot. So don't forget to sign up for the banquet, not only to hear Joel, but because there will be neat door prizes in substantial quantities. And you'll probably get to have dinner with some very knowledgeable microwave operators. How cool is that?

On a different subject, John Ackermann, N8UR, and I just returned from the TAPR Digital Communications Conference (DCC) in Tucson, and it was terrific. There is a lot of excitement about the High Performance Software Defined Radio Project (HPSDR), which TAPR has taken under its wing. This is based on the FlexRadio 1000 software, but with substantially better hardware performance and functionality. If you are into the SDR movement, this is the one to watch. There were plenty of other topics covered there as well, including the latest thinking in amateur satellites and APRS, as well as informative presentations on a variety of topics. Don't let the word digital in the name scare you, as there is a wealth of knowledge shared here that does not require a computer science degree to comprehend.

Lest I forget, but **the picnic** was fun, as always, although the smoke and flames from the grill were a bit subdued compared to prior years. I must be slipping. Many thanks, once again, to Daun and Karen Yeagley for allowing us to invade their domicile for the day. I can't imagine a better place to hold a picnic for geeks! (PFG) Thanks to all of you who attended and helped put up and take down all of the things that needed it, and for just coming out and having a fun afternoon chatting about all of the kinds of things that we love to chat about. That is what makes MVUS special!

The meeting this Friday will be at our usual haunt, although I believe the name has changed. There has been some remodeling done there, so I don't know what the changes are to the room situation. But hey, I can be adventurous. See you there!

Tom, N8ZM

This and That 9-06

- **Bob Hope.** Did you know that Bob Hope worked briefly as an amateur boxer under the name of Packy East? He gave up boxing when he " was not only being carried out of the ring, but into the ring."
[Cyber.Seniors.com]

- **Repeater Heaven.** Picked up a Cincinnati area Ham directory, which also contains a list of oall the area repeaters. There is a total of 167, distributed as follows: 3 on 6m, 70 on 2m, 22 on 1.5m, and 72 on 70cm. No mention of microwaves. [2004/5 Greater Cincinnati Amateur Radio Ass.]

- **Dear Abby.** "I can't trust my husband. He cheats so much I'm not even sure my last baby is HIS."
[No.7 of "most unusual problems"]

- **Memorable Moments.** During high school, we develop we the most vigorous adult bodies we will ever have. At the same time, we possess the least amount of sense we will ever have. This combination produces many memorable moments. [Marilyn / Parade Magazine]

- **Cinema.** "Going to the cinema is time consuming, so when all the other students are working so diligently, how can you do something so irrelevant?" [Yang Luyi, ninth-grader, Shanghai High School]

  Boyfriend. "I never planned to have a boyfriend in high school, because it's a waste of time."
[Li Yafeng, ninth-grader, Shanghai H.S.]

- **Cell Phones.** Walk along any city street and people talking on cell phones are more common than pigeons. Go into Starbucks and a third of the customers are having coffee dates with their laptops.
[Ellen Goodman]

- **Radio.** Charles Lindberg flew across the ocean without radio. Nowadays you cannot walk through the produce isle in a supermarket without at least seeing one person with a cell phone pressed to the ear.
[Garrison Keiler]

- **Saturation.** Cell phone use and revenue has been flat for the previous two years, you can only "yak yak" so much! So the cell phone now becoming more of a multi purpose toy. You can play games, watch TV, shoot pictures etc..etc! All is creating extra revenue for the providers.

- **Wireless Meter Reading.** The old meter is still being used, an ERT-Unit (encoding reading and transmit) is slipped over the old rotating shaft and transmits data every 1 ½ seconds on 910 MHz at .75mW to a reading device about 100 ft away. This unit could be in a car that drives by your house once a month. There are other systems, but this is how it works with DP&L (Dayton Power and Light) in our area. [WB8IFM]

- **MRI.** The magnetic field used to produce the image is 60,000 times stronger than the earth's magnetic field. [Wikipedia]

- **Folk Science.** "Our senses are geared for objects of middle size – between, say, ants and mountains – not bacteria, molecules and atoms on one end of the scale and stars and galaxies on the other end."
[Michael Schermer]

Summaries Microwave Update 2006 of Presentations

Improved Parabolic Dish Feeds for Higher Efficiency

Paul Wade W1GHZ / w1ghz@arrl.net

Simulations of some popular feedhorns with septum polarizers for circular polarization has led to variations of the popular VE4MA and Chaparral-style feeds which have significantly higher calculated efficiencies for prime-focus dishes.

Measurements by WD5AGO show that these improvements are real, not just the figment of a computer's imagination. For offset-fed dishes, a recent paper by Skobolev described an optimized dual-mode feed which indicates high calculated efficiencies. Dimensions and results for all of these feedhorns are described.

Optimized Dual-Mode Feedhorns

Paul Wade W1GHZ w1ghz@arrl.net

Dual-mode feedhorns for parabolic dishes provide excellent performance over a wide range of microwave bands, especially for offset-fed reflectors. For many commercial applications, the bandwidth of a dual-band horn is too narrow, so corrugated horns are preferred, but bandwidth is rarely a problem for amateur use. While excellent performance is also provided by corrugated horns, they are much more difficult to fabricate with limited machining capabilities, so the dualband horn is usually preferred when we wish to tailor a feedhorn for a specific dish and frequency.

A recent paper by Skobolev, et al, describes a series of "optimum" geometry dual-mode horns[1].Simulated performance suggests that these horns can be very high efficiency feeds, and measured results to date confirm this potential. A simple set of design curves makes it easy tofind best dimensions for a specific application.

Automotive Radar Detectors

By Mike Valentine, W8MM, W8MM@ARRL.net

This session will review the history of technological developments in the weak signal detection of microwave and laser transmissions as used on the nation's highways

78 GHz LNA

Advances Towards a Practical 78 GHz Amateur LNA

By Thomas D. Williams, WA1MBA TomW@WA1MBA.org

A small international group of active EHF amateurs, some with precision assembly experience, formed during 2005 to explore the possibility of making a 77 to 78 GHz LNA. We purchased some MMIC amplifiers, and began to share ideas about design and construction. This paper is a status report of that activity.

Along with the concept and basic approach, the most recent advances in this project will be presented at MUD 2006. Our objective is to create a reproducible design adequate for use as both an LNA and a +10 dBm low power amplifier to follow a mixer. When we get the units running well, we will publish the design so that others may copy.

100W PA on 2.3 GHz

By Norio Ueshima, JR3JZM, JR3JZM@proof.ocn.ne.jp

Starting at the 10mW level, an amplifier chain of 4 FETs brings the power up to ten watts. A divider then feeds two Fujitsu FLL1501 U-2C FETs for a total power output of 100 W.

Driver, Pa, supply and an efficient on/off switch are all mounted in one package to arrive at a space saving design. A good heat sink and cooling fan is needed.

Higher power can be obtained combining several units using a power divider as a power combiner. Parts can be supplied by the author.

Microwave ATV

By John Jaminet, W3HMS W3HMS@aol.com

Microwaves, FM, and off the shelf components designed for the C and Ku TV satellite bands combine to form a superior method for transmission and reception of amateur television .Snow is the natural enemy of quality pictures in AM video. Snow can be significantly reduced by using FM and quality satellite LNBs and receivers.

Modern high gain omni directional antennas fed by higher power amplifiers and hard-line coaxial cables can provide outstanding pictures at greater distances than heretofore experienced and in full- time operation. The equipments designed and mass produced for the C and Ku satellites bands offer a much greater ratio of performance to cost than was possible in the very small ATV market.

Microwave ATV using one band for transmission and another for reception permits the operator to observe, measure, and adjust his picture which is simply impossible with an in band repeater. The greater bandwidths possible on the amateur microwave bands permits higher quality pictures in full color with one or two sound sub carriers. The 10 Ghz band in particular offers the possibility of relay operation 24/7 at the one watt level with high gain dishes.

Rotate, Elevate and Feed a Dual Band (10+24GHz) Dish

By Barry Malowanchuk,VE4MA VE4MA@shaw.ca

A 50’ tower supports a number of VHF/UHF Yagi beams, all fed by coax. In between those beams are dishes for the microwaves. The view is clear in all directions but the distances are large! My concept: a good antenna, good feedlines and lots of power. The problems of moving the dishes are dealt with. For scatter elevation it is also important to have elevation capability. A unique way of using an automotive motorized scissor jack for that purpose is described. Elliptical wave guides are used to feed the dishes. That keeps equipment and switching circuits in the shack, a great advantage especially for the many cold winter months in Canada

Four Band, Remotely Controlled Microwave Installation

By Dave Sublette, K4TO, K4TO@ARRL.net

I. The concept

A. The unit will operate on the 2.3, 3.4, 5.7, and 10.3 GHz amateur radio bands. It will be mounted at the 185-foot level on my rotating tower, located 250 feet behind the shack. Band switching and T/R functions will be controlled through a multi-conductor cable. 144 MHz IF transmit and receive will be supplied through one coaxial cable.

II. The operating environment.

A. The unit will be mounted in a weatherproof box. 115 VAC power is available at the point where the box is mounted. One IF cable will supply both the 144 MHz receive IF and transmit drive. A five-wire control cable will be used to control the band switch and PTT functions. A 12.3 Volt, 22 Amp switching power supply will supply all power to the equipment internal to the box.

III. The equipment

A. Down East Microwave Transverters for all bands.
B. Amplifiers follow each, except for 10GHz
C. DEMI preamps on 3.4, 5.7 and 10GHz
D. T/R relays are the SMA types, 28 Volts
E. The IF radio is an Elecraft K2 with internally mounted Down East Microwave 144 MHz transverter board.
F. Antennas- Directive Systems Loop Yagis and Dual feed dish

IV. Drive. T/R and PTT control circuit (band switching)

A. Schematic shown. A printed wiring board was laid out and fabricated using software and manufacturing from ExpressPCB. G6Y relays are used to switch RF and G5V relays are used to switch band select relays. Note: extra switch is not used. Cost…$51.00 for three boards.
B. Drive is switched by the inputs from the five wire control cable and routed to the input of the transverter for the band desired. PTT is routed to the desired band on 2.3 and 3.4 GHz. When either 5.7 or 10.3 GHz is selected, both transverters are keyed because of the dual feed situation. No automatic sequencing.

Three Band All Mode Microwave Transceiver Design

A Transceiver for 2.3, 5.6 and 10.3 GHz

By Thomas A. Visel, Nx1N Thomas@neuric.com

This paper describes the design of a three-band all-mode microwave transceiver with approximately one Watt output (+30dBm) on each band. The author had been out of the microwave and RF fields for almost 25 years, and needed to explore currently available microwave technology and components. The paper therefore begins with such a technology survey. The actual design is still in process and has not yet been implemented, but uses current technology and design practices. It also introduces some of the author's favorite techniques that serve as alternatives to the traditional digital PLL, to reduce phase noise. The paper concludes with design of the primary RF sections and demonstrates use of shared-band **mixers and related methods of RF analog sampling techniques**

Operating Tips for the Millimeter-Wave Bands

By Brian Justin, WA1ZMS/4 WA1ZMS@att.net

This paper will cover some of the operating techniques and accessories that the author has used during such exploits as achieving the very 1st VUCC awards and several DX records on the bands above 100GHz.

Topics covered will include: operating locations, station power sources, antenna alignment and pointing. Attention will also be given to the selection of operating elevation as it pertains to dry air ducts aloft that can be used for their millimeter-wave propagation advantage.

Operating from the Beach

By Zack Lau W1VT ZLau@ARRL.org

Why operate from the beach? Aren't hilltops the only good spots for microwave stations? The best reason is propagation—tropo ducting is far more common at the beach. My best DX on 10GHz is 404 miles, from Hammonasset beach in Madison CT to Reddish Knob in WV. As you move farther inland, great band openings are less likely. Public beaches are easy to find—they are well marked and well known by the locals. The same isn't always true about mountaintops—access roads are often non-intuitive and difficult to find. In New England, there is a significant problem with most mountaintops—they are covered with trees—better known by frustrated microwave operators as "attenuators." A single tree can act like a 20 dB attenuator at 10 GHz. If the weather is really bad—you might not even be able to see the trees on a mountaintop.

Beaches also have their disadvantages. They can be extremely crowded—if you arrive in the middle of the day you might be turned away—but this also occurs with mountaintop locations, such as Mt Wachusett and Mt Greylock. Mt Wachusett is covered with birders during the fall hawk migration. Mt Greylock, the highest peak in Massachusetts, is the site of a war memorial tower. Perhaps the biggest disadvantage is typical signal strength—troposcatter VHF signals are often much weaker, compared to mountaintop locations, due to the low height of antennas over average terrain. The disadvantage is much less at 10GHz—it is easy to install antennas many wavelengths off the ground. This can make liaison work very difficult, perhaps even impossible, without the proper skills and equipment. Beaches often have a bad reputation among VHFers—big multi-operator stations send out people to distant rare grid squares at beaches—they disappear into a black hole for the entire contest. I suspect that many bad experiences are the result of poor planning and preparation, as opposed to bad band conditions.

There are additional benefits to public beaches—you get to represent ham radio. A well done portable operation is a good way to put ham radio in the eyes of the public. Demonstrating ham radio to the public doesn't have to be a once a year event, though many hams only operate at public locations during the June Field Day. Public beaches typically have better facilities and services than mountaintops. This is important if you have health issues—it can take a long time to get emergency help on a mountaintop—a bad situation if you have a stroke or heart attack.

EME on the Microwave Bands

By Al Ward, W5LUA Al.Ward@avago.com

A life-long EME enthusiast, experimenter and active participant, Al is the most qualified ham to talk about and describe how EME works on all the bands starting at 6m and going all the way to a mere 6mm, a factor of 1,000 in wavelengths. Al was himself active in opening up several microwave bands with first contacts. A 23cm (1296 MHz) backyard station is in everybodies grasp who has a backyard, I think I am going to try this as long as we are still waiting for a phase 3 satellite, probably for another year! [Ed]

10 GHz EME

By Mike Murphy, KA8ABR and Jim Miller, N8ECI Murph@erinet.com

An abandoned satellite terminal station is described, including some history of the location where it now stands. Restoration of the terminal equipment for use in amateur EME, radio astronomy and satellite tracking is outlined, including a description of tests done to date (September of '06). Plans for upcoming tests and additional restoration work are described, with the initial goal of EME operations on the 10 Ghz amateur band.

Backyard Microwave EME… What they didn't tell me

Dave Robinson, G4FRE / WW2R, WW2R@mgef.org

The presentation will discuss the lessons learnt when trying to get a 10' C band satellite dish QRV on microwave EME (1296 and 2304MHz).

Tracking issues. Making the "polar" mount a "real" polar mount. Obtaining positional feedback. Setting the dish to track the moon

Building feeds. Mounting the feed on the dish. Remote mounting of RF hardware at the dish

Preamplifier, Amplifier and exciter selection. Frequency stability issues. Results so far

Receiving Voyager 1 with Small Antenna Systems - Amsat-DL P3E – P5A Ground Station in Bochum Germany

By ON6UG, Freddy de Guchteneire, Freddy.DeGuchteneire@UGent.BE

The equipment used for EVE (Venus bounce) experiments and receiving Voyager 1.
Details of the experiment. Some hints to receive deep space probes with small antennas.
Future work at the ground station.

A short video presentation of Amsat-DL and Amsat P3E - P5A satellites.
A brief description of the Amsat -DL ground station in Bochum .

Antenna Range Set-Up

By Kent Britain, WA5VJB, WA5VJB@flash.net

The traditional antenna range with the antennas elevated and including ground reflections as part of the set-up does not work well for the microwaves. After all kinds of problems with this method for frequencies from 1GHz and up, the best method found was to place the source antenna practically on the ground. Numerous examples are stated and graphs are provided to get the points across.

Time and Frequency

By John Ackermann, N8UR, JRA@febo.com

A discussion of the basics of time and frequency measurement, various types of oscillators, and the factors that affect their performance.

Topics:	Short term	Frequency Standards	Measurement Techniques
Notation of time and frequency	Long term	Crystal Oscillators	Frequency Counters
What are we Measuring?	Dissemination of Time and Frequency	Rubidium Oscillators	Oscilloscopes
Accuracy	HF (WWV, CHU)	Cesium Oscillators	Time Interval Counters
Stability	LF (WWVB, LORAN-C)	Masers	The ARRL FMT
Phase noise	GPS	GPS Disciplined Oscillators	Measuring real signals
		REFLOCK	

Oscillators for Converters and Other Projects

By Mike Suhar, WB8GXB MSuhar@who.rr.com

This paper discusses a design for the local oscillator used in the Midwest VHF/UHF Society's Transponder project. While a particular project was in mind for this oscillator it was designed so it could be incorporated into other projects requiring a local oscillator of 100-MHz or higher. The paper goes on to discuss alternate designs to achieving the same results.

The design was approached from a modular perspective. Each module was design then integrated into the previous section. The design considered material, test equipment and construction techniques available to me. The design started with a typical crystal controlled oscillator using a heater to stabilize the frequency. The design continued with amplifiers multipliers, and filters necessary to achieve the desired LO frequency. Consideration was given to possible future uses of the LO chain and replicating the construction for future projects.
This was also an opportunity to consider alternate designs such as GPS stabilized oscillators and PLL arrangements. A second design could be used to compare stability and other parameters with the first. For the alternate design consideration was given to obtaining off-the-shelf modules.

Ansoft Designer for RF/Microwave Projects

By Paul Drexler, W2PED, Pdrexler@hotmail.com

This will be a short PowerPoint presentation with a LIVE demo of the software, and Q&A session.

Software Radio and AMSAT NA Plans

By Bob McGuire, N4HY

MVUS Translator

By Gerd Schrick, WB8IFM WB8IFM@AMSAT.org

Patterned after the Oscar-40 Transponder this earthbound Translator has two inputs at 70cm and 23 cm and a single output at 13 cm. The modules, except for the LOs, were designed and built by Michael, DB6NT. This unit covers in essence the entire allocated bands except the range at 2.3 GHz. The unit will be operated from a two story building on the South Eastern edge of Dayton. Polarization will be horizontal. We are building slot antennas for the higher frequencies and a big wheel for 70 cm. We are looking forward to some very interesting results, and will probably learn a lot and attract many local users.

Additional Papers / no Presentations

Slot Antennas -- W5OE, Robert Templin (Summary only)
Off-Center Fed Dish -- W6OAL, Dave Clingerman
Scalar Feedhorns for a Low F/D Dish -- WD5AGO, Tommy Henderson
Two 24 GHz Rigs -- KH6WZ, Wayne Yoshida
FT-920 as Microwave IF – W5ZN, Joel Harrison
Noise from the Stars -- WB8IFM, Gerd Schrick
Quarter Wave Cavity Filters Using Copper Pipe -- Mike Suhar, WB8GXB
24 (28)V Relay Driver -- WA3IAC, Chuck Steer