

Vol. 17 No. 9

[www.mvus.org](http://www.mvus.org)

Nov / Dec 2003

Club Memorial Call W8KSE

**10 GHZ Beacon: 10368.750 KA8EDE EM89ap OH Xenia (50 mW 16 slot waveguide at 89')**

Our **November Meeting** is on Fri. 28<sup>th</sup> at 7:30 PM at the Perkins Restaurant at SR 73 and I-75.

The **X-mas Family Meeting** is on Fri the 26<sup>th</sup> of Dec same place and time

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### Upcoming:

#### **Nov 19 .... ARRL Frequency Measurement Test at N8UR**

We're planning to have an **informal work session** on the weekend of the 15/16 (probably Sunday afternoon) to set up for the FMT and do any calibrations that anyone might want.

The FMT itself is at **9:45 on Wednesday evening, Nov. 19**. It only lasts 15minutes but we'll start setting up by 8:00 or so. Visitors are welcome, but please RSVP so I know who and how many to expect.

**Directions** -- 15 Grandon Road. 2 houses west of Far Hills, three blocks north of the stop light at the north end of the Oakwood business district. Warning -- on the east side of Far Hills, Grandon turns into Corona and that's what the street sign on the east side says. Phone is 299-8445 and I can listen on 443.5. John, N8UR.

**10GHz Gunn & Mixer Diodes available, contact Tom, N8ZM**

*Have a Super Thanksgiving and a Wonderful Christmas...De N8ZM*

Gerd advises me that our newsletter printer is running a special that we take advantage of before the end of October, so I am writing this very early, and in a bigger hurry than usual! As the meeting was just last week, my memory won't be taxed so much, either. This will serve as a combined November-December Anom Prop.

Actually, this gives me an opportunity to cover a few things that otherwise would have passed before this went out. An interesting event coming up in November is the ARRL Frequency Measuring Test, wherein W1AW sends out signals on several HF bands, and the objective is to see how close you can come to the League's official readouts. John Ackerman, N8UR, has been involved in this activity for a long time, and for this session, he is organizing the first Multi-multi class FMT. John has offered to host the session at his place on November 19, and provide the antenna and frequency reference for us to try several different methods, pieces of equipment, whatever, to try our hand at it. He has also planned a trial run/setup session at his place for the Saturday prior, November 15<sup>th</sup>. More details are on the contents page. Also we will sent out more, as time draws closer, via the MVUS e-mailing. If you aren't on that list, and want to join in the fun, call me (937-667-5990) or John (937-299-8445) for details and directions. I am looking forward to it, because, as John says, it isn't quite as easy as it looks!

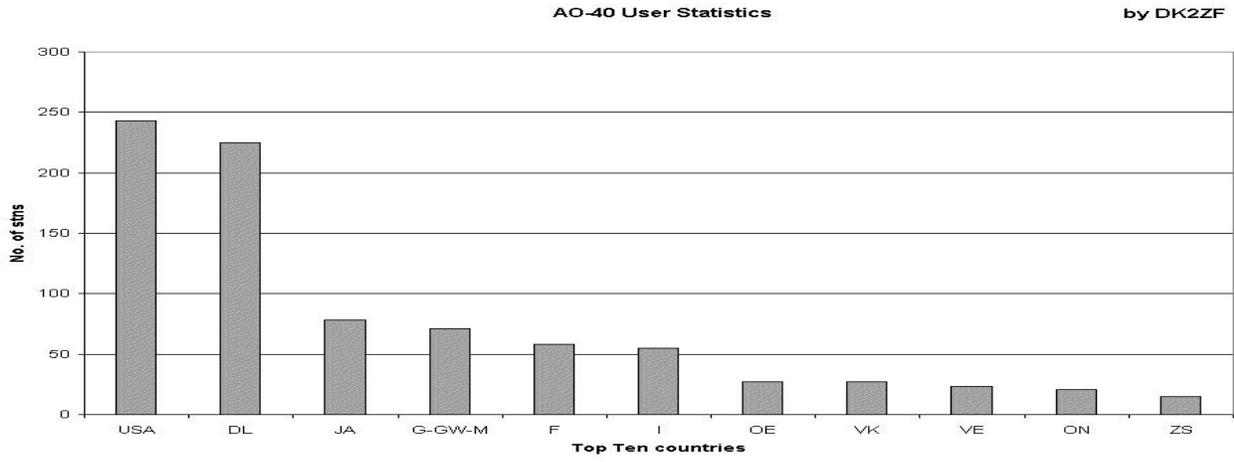
We have set the dates for the next couple of meetings. The November meeting will be on the 28<sup>th</sup>, the day after Thanksgiving. Our December Dinner party is planned for Tuesday the 30<sup>th</sup>. We felt that was a good night to start warming up for New Years Eve! We'll be at the Perkins, unless someone makes us a better offer. And remember to bring the family, as this is a social event!

We have uncovered another couple of boxes of radar detectors, which we would like to disassemble for the Gunn and mixer diodes, and any other salvageable parts that anyone finds interesting or useful. I have one volunteer to take on a box, and would like to have one more. We have been quite successful selling the diodes in the past, and hope to move this last batch quickly. Finishing up this batch will significantly reduce the storage space requirements at Daun's place, and mine, which in turn will lead to greater domestic tranquility, if you know what I mean. I know you married guys do!

We also have several 2 GHz microwave link packages that we would like to dismantle for their parts, to be used in club member projects, or flea marketed, maybe as soon as Ft. Wayne (11/15 There are amplifiers, circulators, filters, IF receivers/exciters(probably FM), and other modules, as well as a lot of semi-rigid coax pieces with N or SMA connectors). If you would be willing to help the club out, call or e-mail me and I will work out a plan with you.

So there you the Early Edition. Have a Happy Thanksgiving and a great holiday season! Tom, N8ZM.

As of Jan, 2003



## This and That 11+12 / 03

- **Humongous Sunspots.** A couple of real big sunspots brought the numbers up from a paltry low 90s to 230 on the weekend of the CQ-HF-Contest (Oct 25/26). Band conditions were as good as 2 years ago! I have not heard of anything but chances were the magic band might have had openings! (see Picture)
- **Wind power.** A couple of windmills are being completed near Bowling Green, Ohio. The three-bladed props are 264' in diameter mounted on a 257' tower. Connected to a generator they will produce 1.8 megawatts each. It is the first "utility size" wind farm in Ohio. Four years ago I saw several wind farms with dozens of mills in California. [WB8IFM]
- **Fuel Cell Power** Finally this kind of power supply, after in use on spacecraft for many years, is coming down to earth. There are now affordable smaller power supplies available. In a few years it might be common to see in a ham shack a fuel cell power supply sitting next to the usual AC fed supply. In case of a power failure a steel bottle filled with hydrogen in the corner of the shack will keep the station on the air, and there will be a drip pan underneath to collect the water being produced. Those supplies typically deliver 24V at 40 Amps and are comparable in cost to a 10 year battery back-up system [Source: EE-Times]
- **Contended System.** ADSL links usually start at 512 kbps download (from the internet) and 128kbps upload (to the internet) – as its name suggests (Asymmetrical Digital Subscriber Line) this service is not symmetrical. It is also important to note that this system is usually '**contended**'. This means that users share bandwidth with other users leading to a considerable drop in connection speeds at busy times. [ADSL Provider]
- **The Big City.** Too many people that know nothing. You could not learn anything from them. They don't know the difference between silk wool and cotton. They don't know how radio or TV works, not even how automobiles got their strength to move about. [Hermes in God of Audacity by Nadolny]
- **Explosion of Radio.** Actually radio in its infancy was growing much faster than the computer today. In 1924 the AM band, 550- to 1550 KC, contained 1400 stations who had 3 million radios tuned in with daily base ball games. Receivers: superhets, reflex sets, TRFs, neutrodynes were so complex that there was a need for a new occupation. The radio repairman came into existence.
- **Vision.** Eyesight may diminish with age, but all other forms of vision – hindsight, foresight, second sight, and insight improve, as we get older.
- **Test of Will.** The Wright brothers were known for their spirited debates. They tried hard to find the truth. They never believed that compromise was a substitute for finding the truth of an issue. [The Wright Way: 7 Problem-Solving Principles from the Wright Brothers. By Mark Epler]
- **Good Pills, Bad Pills, Useless Pills.** "If the whole *material medica* could be sunk to the bottom of the sea, it would be all the better for mankind and all the worse for the fishes." [Oliver Wendell Holmes, 1860]
- **Just Do It.** "Man who say it cannot be done should not interrupt man doing it." [Old Chinese Proverb]
- **Mach 3 Triple Blade.** Gillette introduced this shaver after spending a reported \$ 750 million to develop it. There is big money in selling shaving tools. The average guy spends 800 hours of his life shaving. [Eils Lotozo]

## Another Japanese Innovation Tokyo, 1Apr, 2000

For you folks who are contemplating a new computer.

Sony has announced its own computer operating system now available on its hot new portable PC called the Vaio. Instead of producing the cryptic error messages characteristic of Microsoft's Windows and DOS systems, Sony's chairman Asai Tawara said, "We intend to capture the high ground by putting a human, Japanese face on what has been until now an operating system that reflects Western cultural hegemony. For example, we have replaced the impersonal and unhelpful Microsoft error message with our own Japanese *Haiku Poetry*. The haiku messages are just as informative as Microsoft's and they make you pause just long enough that you're able to fight the impulse to put a fist through the screen." The chairman went on to give examples of the error messages:

### **You seek a Web site.**

It cannot be located.  
Countless more exist.  
Chaos reigns within.  
Stop, reflect, and reboot.  
Order shall return.

### **ABORTED effort:**

Close all that you have worked on.  
You ask way too much.  
Yesterday it worked  
Today it is not working  
Windows is like that.  
First snow, then silence.  
This thousand dollar screen dies  
So beautifully.

### **"June Sales.doc" not found**

With searching comes loss.  
The presence of absence.  
The Tao that is seen  
Is not the true Tao  
Until you bring fresh toner.

### **Windows NT crashed.**

The Blue Screen of Death.  
No one hears your screams.  
Stay the patient course.  
Of little worth is your ire.

### **The network is down.**

A crash reduces

Your expensive computer  
To a simple stone.  
You step in the stream  
But the water has moved on.

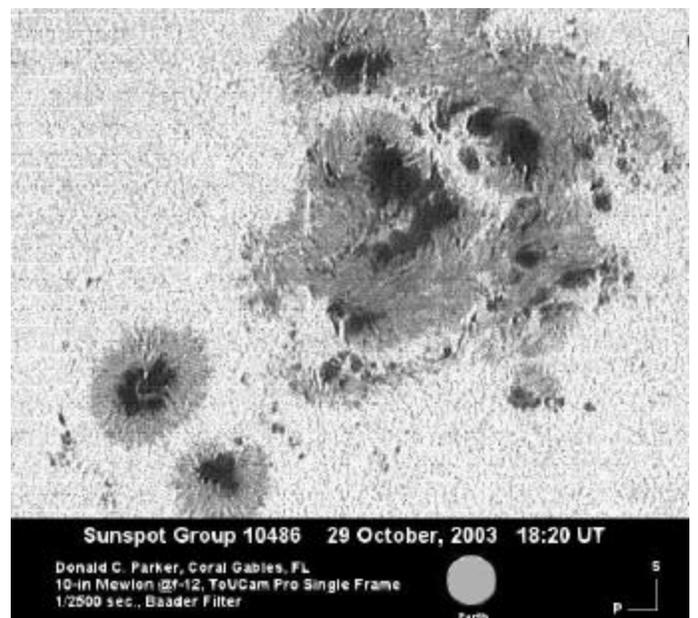
### **Out of memory.**

We wish to hold the whole sky,  
But we never will.  
Having been erased  
The document you are seeking  
Must now be retyped.

### **Serious error.**

All shortcuts have disappeared.  
Screen, mind, both are blank.  
Three things are certain:  
Death, taxes, and lost data.  
Guess which has occurred.  
A file that big?  
It might be very useful.  
But now it is gone. \_\_\_\_\_

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# What is HSMM Microwave Radio?

BY

John Champa, K8OCL

What is this HSMM stuff we hear about? What kind of microwave radio do I need to use that? Is this something cool and fun that I might enjoy? Is it expensive? What microwave frequencies are used? Will I understand how it works? What can it do?

First, HSMM stands for High Speed Multimedia radio. It is not a specific operating mode, but more of a direction or driving force within amateur radio.

Second, HSMM, although digital radio, it is NOT primarily keyboard radio communication, as in packet radio. Amongst the capabilities of HSMM radio most used are digital voice (DV) and digital video (ADV). Yes, you can type keyboard messages back and forth (chat mode) as in PSK31. You can also do file transfers as in RTTY, but at significantly higher speeds! Plus, if there is a server on the radio network, you can do e-mailing and maybe even surf the Internet by sharing a high-speed Internet connection with another amateur. That is why it is called multimedia radio.

NOW WHAT? So you may ask, how can we use this? Imagine being at an emergency scene and being able to send live video images of what is happening back to everybody on the HSMM radio network, back to the EOC, and without using expensive ATV equipment. All that is often needed is just your laptop computer, a special PCMCIA card, your digital camera, and a small antenna. Except for the inexpensive special card and the antenna, you may already have all this gear!

So, now that you know what it is, how about a little history to show how it evolved?

## BACKGROUND

A survey conducted by the ARRL Technology Task Force, of League members and other amateurs revealed that the number one amateur radio interest in new technologies was in high-speed digital radio networks. Some suggestions were:

- High-speed radio data links up to 20 mega bits per second (M bit/s)
- Ethernet at 2 mbps on 10 GHz
- Encourage development of a high-speed amateur digital radio network
- High-speed digital audio/video radio

In January 2001, the ARRL Board of Directors voted unanimously that the ARRL should develop high-speed radio digital networks for the amateur radio service. The ARRL President appointed a group of individuals knowledgeable in the field from the international amateur community and industry. The group would report to the Technology Task Force, and its chairman is the author of this article.

## THE HSMM WORKING GROUP

The working group's first focus is on creating the microwave skills within the amateur radio community that are necessary to build and support portable and fixed high-speed radio based local networking. That's where amateurs interested in HSMM microwave radio can offer the most value to local RACES and ARES organizations, as well as to homeland security and other emergency communications efforts at the present time.

During Field Days and simulated emergency tests (SET) we encourage amateurs to hone their skills in doing rapid site-surveys and deploying broadband HSMM microwave radio networks in the

field. Some clubs put all their Field Day stations with their laptop-based log books onto one radio local area network (RLAN) so, for example, if you are working 20M you can see that the 15 meter band has just opened up because that tent's logging score is going through the roof (HI). During the recent Midwest VHF-UHF Society (MVUS) Picnic 2003, an RLAN was used to link antenna test measurement results back to a printer. You get the idea. Use your imagination. The possibilities are almost without limit.

In this process of everyday use of HSMM microwave radio, we are trying to understand how to enhance the reliability of our mainstream amateur radio network connections. Through various emergency communications training programs we will be trying to incorporate information to help local hams to be the people that deploy these high-speed microwave radio networks on demand.

One way you can become involved today is by adapting off the shelf IEEE 802.11® gear to operating within amateur radio regulations. This equipment is also known as WiFi equipment, and is commonly available at computer equipment retailers. As sold, the equipment operates in the 2.4 GHz ISM bands under part 15 rules. The 802.11b standard was developed about 6 years ago for the purpose of providing a wireless alternative for office LAN installations. This wireless capability was to allow office LANs to be deployed without the expense and nuisance of running CAT5 cable to each computer. Due to the increase of homes with multiple computers as well as rapidly falling price points for WiFi equipment, WiFi hardware has had a significant penetration into the home market place. In fact, in a recent CQ survey (What You Have Told Us, CQ, September 2003, p.40) 8% of the respondents reported already using some kind of wireless networking, so there is already a growing understanding of the technology within the amateur ranks. A number of Livingston County amateurs already use WiFi in their homes.

The equipment as purchased has significant operating limits. Due to the Part 15 operating rules, power is severely curtailed. Remember, just like cordless phones, this hardware has to allow uncoordinated operation of many unlicensed devices with minimal interference. In addition, many users of this technology adopted it because it allowed unencumbered connectivity for a laptop computer. By nature of the fact that a laptop is battery powered, most client cards offer only a small fraction of the power authorized under Part 15 rules, in order to maximize battery life.

Depending on your needs, as an Amateur neither of these considerations is a limit on your use of the WiFi technology. While a system as sold may have a range of only 50 to 100 feet, proper setup of a system under amateur regulations can provide coverage far in excess of that distance. In fact, one of our HSMM Working Group's test networks, called the Hinternet, in Livingston County Michigan can easily do 5-15 miles ranges, at speeds of up to 54 M bit/s (half-duplex) using small mast mounted dish antennas in conjunction with off the shelf consumer grade hardware.

## GETTING STARTED IN HSMM RADIO

Getting operational with this equipment is a bit more complex than going to Universal Radio®, buying an HF, VHF, or UHF rig and going home and connecting a key, microphone and antenna. Because this is data radio local area network (RLAN) equipment, it expects to be communicating with a computer, or more precisely with software running on a computer. So you first must decide what interfaces you are going to need to connect to your computer. Luckily, equipment is available for all the standard computer interfaces: Ethernet, USB, and PCMCIA.

If you use a laptop in your station, get the PCMCIA card. We recommend the type with an external antenna connection.

If you have a PC, get the WLAN (Wireless LAN) adaptor type that plugs into either the USB port or the RJ45 Ethernet port. Select the one best suited to your computer and your experimentation.

This is the heart of your new microwave digital radio station. It is a computer-operated HSMM 2.4 GHz microwave radio transceiver and it will probably set you back about \$60-\$80. It is usually easier if you start off teaming up with another ham radio operator living nearby, and do your initial testing in the same room together.

Then as you increase distances going toward your separate station locations, you can coordinate using a suitable local FM simplex frequency. The most often used HSMM microwave voice coordinating frequency is 446.00 MHz, the National Simplex FM Calling Frequency for the 70cm band

Go to the local OfficeMax ®, Radio Shack ®, ABC Warehouse ®, or other consumer electronics outlet and purchase some economical and readily available wireless local area network (WLAN) devices. We recommend that you select devices that state they comply with IEEE 802.11b and are WiFi compatible. Because these devices are made by numerous manufacturers each using different techniques to achieve the same thing, there were initial complaints about interoperability between devices of different manufacture. An industry group known as the WiFi consortium, was formed to provide testing and certification of 802.11b devices. If the equipment is WiFi certified, it will interoperate with any other WiFi certified equipment, thus easing your initial installation and troubleshooting by assuring that device compatibility is not the root cause of a start up problem. These devices operate on 2.4 GHz band using direct sequence spread spectrum (DSSS) modulation at speeds up to 2 mbps and complementary code keying (CCK) modulation for speeds of 5.5 and 11 M bit/s. Operating speed is automatically selected by the equipment based upon signal to noise and signal strength of the operating channel. These 802.11b devices are usually the least expensive, are the easiest to work with, and offer the good propagation.

If you can afford a few extra bucks, move up to the newer IEEE 802.11g devices. 802.11g is a relatively new standard that increases the speed of the channel from 11 M bit/s maximum to 54 M bit/s maximum. They also operate on the same 2.4 GHz frequencies, but use a form of modulation called orthogonal frequency division multiplexing (OFDM) to achieve the higher data rates. OFDM requires significantly more signal strength and signal to noise ratio in order to achieve 54 M bit/s throughput but appears to tolerate multipath effects caused by radio signal reflections better than CCK modulation, so it may offer better propagation characteristics in certain cases.

When purchasing your equipment there are a few things to be aware of. First make certain the supplied rubber duck antenna(s) are removable and/or there is an external antenna port. If the device does not have an external antenna connection, check Don Rotolo's (N2IRZ) article in the February 2003 CQ for details on how to modify the device. Second, look at the radio specifications for the device. The transmit power and receive sensitivity varies widely among devices. Try to buy a device with the best (highest power and lowest receive sensitivity) specifications. The best generally available equipment has 100 mW (20 dBm) transmit power and -93 dBm receive sensitivity at 11 M bit/s, while the poorest specs are 25 mW (13 dBm) transmit power and -87 dBm receive sensitivity at 11 M bit/s.

Radio at these frequencies behaves the same as radio at any other: a 6 dB power increase will double effective range. Here we're dealing with a 12 dB advantage of the higher performance equipment versus the lower. In a small Part 15 home WLAN the difference is probably not noticeable. For our purposes operating longer distances under amateur radio regulations, a 12 dB difference is critical, and can make the difference between successful experimentation and frustration and failure.

If the device does have an external antenna connection, then go to any issue of CQ Magazine and look up Nermal Electronics ®, CableXperts ® or other cable supply source and order an 18"-24" strain relief cable, also called a pig tail. Order the type of pigtail needed for your device. It will probably cost less than \$20. If you purchased a PCMCIA card, the pigtail will have a strange looking miniature antenna connector at one end, and should have a normal N-series connector at the other.

The first thing you will need to do is install the device in your computer. If you are using a PCMCIA or USB device you will need to install drivers. If you are using a device with an RJ-45 Ethernet interface, no drivers are needed for the device, but there are drivers needed for the Ethernet port in the computer. Additionally there will be a method to communicate with this device for configuration. The included directions will explain how to accomplish this.

After you load up the software drivers on your PC, you will have 2 choices for configuring the equipment: ad-hoc and infrastructure mode. For now, set the device for “ad hoc” mode, and set it to any channel between 2 and 5 (they’re in the correct portion of the amateur band). If all is operating correctly, the two cards (yours and your buddies) should see each other and set up a communication session. Once the cards are talking, you can share files between the 2 computers in the same manner as if the computers were hardwired together on a LAN.

Once you have the cards tested and know you have a connection between them, it’s time to add the outdoor antennas and see what distances you can achieve between the 2 devices. Hook up any external commercial (e.g., Comet ®) or home-brew 2.4 GHz antenna. Shop around where the AMSAT-OSCAR 40 guys buy their Mode-S antennas for some good designs. Keep in mind, the higher the gain of the directional antenna, the smaller the main lobe will be, so aiming a high gain antenna will be more critical than aiming a low gain one. Most 802.11 equipment has a utility included that shows signal strength and signal to noise ratio. Using this utility to monitor signal strength as you aim your antenna will be of great assistance in finding the optimal aiming direction. Remember these antennas are directional in both horizontal and vertical planes, so you have to carefully aim in both azimuth and elevation to get optimum signal at the receiver.

Another thing to keep in mind is coax. Coaxial cable losses at these frequencies are enormous. Don’t even try to use RG8 cable to connect between the device and antenna. You will need to purchase the best coax you can afford in order to keep line losses minimized. In fact the antenna coaxial cable will likely be the most expensive part of the entire station, as you will want to use the lowest loss type you can handle, e.g. LMR-400, etc.

That’s all there is to it. Best of all, you may not have spent more than \$100 so far, depending on what antenna hardware you have around.

Now point your antennas at each other, and fire away. At these power levels there is not much concern for RF safety, but if you are using a high-gain antenna, it is recommended you avoid standing directly in front of the business end while on the air.

Do remember that it’s your responsibility to properly identify your station during use. In the mode you are presently in, the ad hoc or direct station-to-station mode, the most common technique is to simply ID in-mode, i.e. if you transmitting voice, simply speak your call sign into the microphone. If you are transmitting video, just hold a QSL card up to the camera. Or, you can send a ping containing your call sign. Remember that as long as the RIC (radio interface card = short for a WLAN PCMCIA card used for HSMM radio) is operating, even with no traffic, the system is transmitting!

Depending on how close your ham buddy is to your location, how high and clear over the trees your antennas are (2.4 GHz doesn’t go through trees very well), the quality of the coaxial cable you are using and many other factors, you should be able to get several miles range. Remember, these HSMM microwave radio devices are truly QRP and run only about 30-100 mw of RF output, so be resourceful and experiment often with different antennas, etc.

If your signals are not covering the path between you and the nearest other HSMM microwave radio station, then open a copy of any edition of the ARRL Handbook and read the sections on antennas, transmission lines and UHF propagation. Consider putting the antennas higher, getting or building higher gain antennas, using lower-loss coaxial cable, etc. until the link is achieved.

You may also find a way to mount you gear at the antenna, and avoid the expense and loss of coaxial cable, too. This is another reason to consider devices that have Ethernet output. Standard CAT5 Ethernet cable can be run up to 300 feet with no loss. In comparison, USB can only be run 9 feet without a signal booster being installed. By using an Ethernet based device, it is easy to remotely mount the unit close to the antenna and run cheap CAT5 cable back to your computer.

Running higher power is an expensive last resort. Not just because it is a sound operating practice to run the minimum power needed to maintain the communications, but also because it is just good old-fashioned common sense. Be considerate of others who may be using the band, both amateur and non-amateur. Use only the minimum power needed for the link.

## HSMM MICROWAVE RADIO REPEATERS

The next step up the functionality ladder is to add a “repeater” to your system. More properly called wireless hubs or access points (AP), this device will allow several amateur radio microwave stations to share the network (and all the devices and circuits connected to it). An 802.11b AP will sell for about \$100 and 802.11g AP for about \$140. The AP acts as a central collection point for traffic, and can be connected to a single computer or to a network. It can also be used to allow several amateurs to share one high-speed Internet connection. The AP is provided with an ESSID, which is the name it broadcasts. For our purposes, the ESSID can be set as your call sign, thus providing automatic, constant identification. To use an AP in your network the computer users have to exit ad-hoc mode and enter infrastructure mode. Infrastructure mode requires you to specify the network the device belongs to. This is what the ESSID does: identify the AP to its users, so the users can find the home system they belong to. Set your computer device to recognize the ESSID you assigned to your AP.

The AP can also be used as one end of a point-to-point network. For example, if you wanted to extend a network connection from one location to another, you could use an AP at the network end and use it to communicate to a computer at a remote location.

Using an AP allows more features and security than provided by ad-hoc mode. For example, most APs provide DHCP service, so they will automatically assign an IP address to the computers connected to the network. In addition, they provide filtering that allows only known users to access the network.

What frequency do you set on the AP? The HSMM Working Group recommends to everyone that they avoid using channel 1 (center frequency of 2412 MHz). Use of this channel may cause interference to the AMSAT-OSCAR 40 satellite downlinks. The WG also recommends that amateur radio stations avoid the use of channel 6 (center frequency of 2437 MHz). This is the most common default frequency used by the majority (80%?) of Part 15 unlicensed stations for wireless local area networks (WLAN). At present, the most popular frequency used by amateur radio microwave stations for HSMM research is 2427 MHz (channel 4).

NOTE: If you use an HSMM microwave repeater to share high speed access to the Internet, don't forget amateur radio content restrictions, e.g. no porn, no commercial business e-mails, etc. Don't worry about pop-up ads. Pop-up ads, although a nuisance, are no more illegal than an ATV station transmitting an outdoor scene inadvertently picking-up a billboard in the station camera.

## HSMM SOFTWARE

For operating software, most amateurs are using Microsoft ® NetMeeting collaborative software, which comes free with the Microsoft Windows ® operating system. Other forms of open source groupware using Linux are also popular. Try using OpenH323 or Speak Freely. By connecting a microphone to the audio input of your soundcard, you can have digital voice QSOs. By connecting an inexpensive digital camera (\$20) you can do digital video QSOs. These are not the same quality as the usual ATV contacts, but the equipment is much less expensive! (HI)

## HSMM TRAFFIC

How do you keep Part 15 unlicensed traffic from accidentally using your Part 97 licensed HSMM network? A traffic separation technique that is considered acceptable involves the use of WEP (wired equivalent protection)...NOT for encryption, but for authentication. If you

use this approach under Part 97, therefore, you must publish the WEP key. We recommend that you ask that your HSMM repeater's WEP key be published on the HSMM webpage ([www.arrl.org/hsmm/](http://www.arrl.org/hsmm/)), or simply use the amateur common WEP key already designated on that webpage. Again, the WEP is used to avoid the accidental mixing of Part 15 and Part 97 traffic, i.e. authentication, NOT encryption. Another approach gaining in popularity with many HSMM microwave stations is the use of 44 domain IP (Internet Protocol) addresses, which are only available to the amateur radio service.

#### RECOMMENDATIONS

Amateurs of all license classes are encouraged, to get on the air with inexpensive HSMM microwave radio using 802.11 off-the-shelf gear operating under amateur regulations. It is easy, low-cost spread spectrum microwave radio experimentation. For more details and for the latest developments on all these initiatives, check out the link to HSMM WG open reflector at Texas A&M University on our webpage: [www.arrl.org/hsmm](http://www.arrl.org/hsmm).

#### SUGGESTED READING

##### Articles:

- Ford, Steve - WB8IMY, "VoIP and Amateur Radio," QST, February 2003, pp. 44-47.  
Mraz, Kris I - N5KM, "High Speed Multimedia Radio," QST, April 2003, pp. 28-34.  
Olexa, Ron - KA3JIJ, "Wi-Fi for Hams Part 1: Part 97 or Part 15," CQ, June 2003, pp. 32-36.  
Olexa, Ron - KA3JIJ, "Wi-Fi for Hams Part 2: Building a Wi-Fi Network," CQ, July 2003, pp. 34-38.  
Reinhardt, Jeff - AA6JR, "Digital Hamming: A Need for Standards," CQ Magazine, January 2003, pp. 50-51.  
Rinaldo, Paul L. - W4RI, and Champa, John J. - K8OCL, "On The Amateur Radio Use of IEEE 802.11b Radio Local Area Networks," CQ-VHF, Spring 2003, pp.  
Rotolo, Don - N2IRZ, "A Cheap and Easy High-Speed Data Connection," CQ, February 2003, pp. 61-64.

##### Bios

John Champa, K8OCL, is Chairman of the American Radio Relay League (ARRL) Technology Task Force on High Speed Multimedia (HSMM) Radio Networking. He can be reached Moon Wolf Spring, 2491 Itsell Road, Howell, MI 48843. e-mail: <k8oc1@arrl.net>.

## **Antenna Building Hints**

By Steve, K8UD, and Gerd, WB8IFM

Antenna building season, if there is such a thing, is just about over, and I am still not finished with my project, a new satellite dish at 80' up on my tower. However, in the process and working with others a number of useful tricks were found that are worth to be recorded. So this will be a list of "clip and save" for future reference.

First, if at all possible, have at least one other person; better two, available for tower work. At least the "ground crew" should wear hardhats to protect from fallen objects. Not wearing one, I got lucky last year, but it was close! Taking down towers that have been up for a while is tricky, allow plenty of time, use penetrating oil on the joints and let it sit before removing the bolts and prying apart the sections. Use a hydraulic jack for the latter, and, of course, a gin pole to lift and lower the sections. An assortment of wooden blocs is needed to help prying the sections apart with the jack.

The climbing party should use a climbing belt and take with him a half-bucket, fastened to his belt with tools and parts, and finally take with him an extra rope (Steve recommends to take two, in case you drop one), enough to form a loop that can be used to pull items up or let items down. Some extra shorter pieces of rope should be carried along also to tie up things temporarily. Work gloves are also highly recommended especially if you take an older installation apart and lift heavy objects like tower sections..

If you build a tower from used tower sections, inspect each section critically; match and assemble the entire structure on the ground, using oil at the junctions, mark the pieces then take it apart for mounting. This method, to pre assemble everything before finally mounting, I learned when I was involved putting the P3d (now AO-40) satellite together. Some items, I remember the antennas, were put on then taken off again at least a dozen times. Of course, not all the holes lined up perfectly and after a while you remembered, which ones would give you a little trouble!

Use stainless hardware, I found a close by Home Depot with a good assortment and (if there is such a thing) reasonable prices. I checked four other sources, including another Home Depot and they were all wanting.

For connectors use the watertight "N" and additionally apply Vaseline to the contacts and threads. Other connections, for rotators etc, do the best you can, then place the contraption inside an upside down aluminum beer can taped to a tower leg.

To protect steel surfaces a friend from Germany used and recommends Zinc Spray. This is at least 90% Zinc and the next best thing to have it hot dipped like a Rohn. It is labeled "Industrial Product" and meant for Professionals only! However, all the sources I have located so far are either in the UK or other European countries. So you might have to settle for ordinary "silver paint"

Make sure, all your rotors have adequate drain holes at their lowest point. The factory might just put in one little hole, which could plug up easily. So make it a little bigger, maybe 1/16, and add another one! The idea is to let the moisture out but not let bugs get in!

### **A Niftier Program** By John, W3HMS

Looking at the note on "Two Nifty Programs" in the Vol 17 #8 reminds me that the microwave antenna program by Paul Wade, W1GHZ, is perhaps easier to use and does not require having the EXCEL spreadsheet software.

His program is called hdl\_ant.exe. It is a DOS program usable on any PC with no extra software. It is available free from Paul's Web site as is his superb "Online MW Antenna Handbook". No mwer should be without it! Look for the software on the "contents" page of the handbook.

## **Linux - Is it for you ?** By K8UD - Steve Coy

This article is a continuation from the **August 2003** Anomalous Propagation.

I have a rather inexpensive (nice way of saying cheap) motherboard made by Chips (Taiwan). It uses SIS chipset and runs at 333MHZ. I just bought a 120G hard drive and decided to split the drive in half, 60G for Windows, and 60G for Linux. After you use the Linux version of FDISK, you install the Windows system. I had some problem setting up LILO in the Master Boot Record. When installing Windows, windows wants to keep the master boot record to itself, so I had to install Linux twice after I found out how to do it correctly. After you have windows up and running, then I installed Linux from the Internet using a boot floppy. (Having DSL is nice!) At the end of the installation, Linux asks if you want to run dual boot system, of course I said yes and it sets up a short program in the Master boot record which you can select which system to boot: Linux, Windows, or any other system you may have. Sounds easy, but this took me 3 evenings.

Once you get Linux installed, usually, it boots into what looks like a dos prompt. While installing the system, the installation process may ask you questions about your video, sound, etc. It would be easier to have the following information at installation time, however, not necessary, but it helps. However, if you ever want to change anything, you better know and understand how Linux works and where it puts the information so you can retrieve it then, change it. Here are a few examples I have run into while I was installing Linux.

### **Linux Video**

To install your video driver, you need to know your refresh rate, your sync rate, what modes, 640, 800 1280, etc. Also, 256 colors or 16Million. What chip set you are using, Orchid, Tenseg labs, SIS. Once you have all the information, then you can configure your GUI interface, usually X11. Once this is completed, then you can start your X-windows. I selected K windows, but you can select other interfaces, such as Gnome, or plain X windows. Also different formats within the desktop you select can also be accomplished.

### **Linux Sound**

Probably one of the most difficult one to approach. I have a built in sound chips on my motherboard, so I would like to use that. However, the CD I got for the Motherboard only had drivers for Windows. Hmm, after extensive searching on the Internet I finally found a PNP (plug n play) utility that recognized the sound chips and with more tweaking, got the IRQ's and DMA's all set up. Still, I have problems of "sparkles" on playing MP3's, but seems to be working OK. I tried to get ALSA (Advanced Linux Sound Applications) to work, but as of this time, no go on this endeavor.

### **Linux Ethernet**

I found that either it works or it doesn't. Finding the correct driver is the hardest problem. I found a driver for net gear; it was listed under National Semi chip set (look at the IC on the card). On another card, I found in my junk collection, an Intel, which worked out to be an IBM 100-pro series driver. Getting the correct driver seems to be the biggest challenge. I did find support for 3com 3C509; however, it conflicted with the ISAPNP utility, which in the setup utilities mentioned that conflicts will occur with other PNP devices, so care must be taken when using the ISAPNP utility. Since I can get no other driver to work with the Sound chips I shall stick with the ISAPNP utility and not use the 3com NIC board. **\*\*Update\*\*** While having my NIC card working, I didn't realize it, but I had a very slow uplink. Downlink was in the good range, but uplink was averaging 2-3kb, much slower than a dial up link. This only occurs with the PCI card. I reinstalled the 3com and got it to work. The 3com NIC was an older version and it has multi-connectors, thin net (coax), AIU, and RJ-45. While it worked OK in a Windows environment, it didn't under Linux. After several hours of troubleshooting, I finally found out that the card was defaulted to the thin net connector (the coax). The only way I can get it to work under Linux, was to use a dos program and change the default to the RJ-45 connector, then return the EPROM on the

NIC. Yehaw! I got it to talk to the outside world. My uploads are back to normal (135K) and my downloads are at 685k. Finally!

## **Linux Mouse**

because I want to use my Linux with SSTV and PSK31, I needed another serial port. Since the advent of usb, and my computer has 2 usb slots, I decided to get an usb mouse. Nothing immediately jumped out at me on how to configure it, so I googled.... and found the answer at <http://www.linux-usb.org/>

### **Q: Why is /proc/bus/usb/devices empty?**

A: Most likely because you didn't configure your system with a USB host controller: uhci ("alt"), usb-ohci, or usb-uhci. The simplest way to set up is to build these as dynamically linked kernel modules, and use the hot plug scripts (above). You can statically link those drivers, if you make sure you've got the right one(s) for your hardware! Then add your mouse driver. Last item on the usb mouse is that for some reason, mostly while the computer is disk casheing, Linux looses the mouse driver (the mouse freezes). The only way to get it to work again is to unplug it and plug it back in. Hmmmm.. Still working on this problem.

Other than this last little problem. I now have a working Linux system. Now come the programs.

More next month for the conclusion.... 73 de Steve, K8UD

**In replying to an Invitation to a Scientists' Ball, the following reactions were noted.**

Pierre and Marie Curie were radiating enthusiasm.

Einstein thought it would be relatively easy to attend.

Volta was electrified, and Archimedes was buoyant at the thought.

Ampere was worried he wasn't up to current research.

Ohm resisted the idea at first.

Boyle said he was under too much pressure.

Edison thought it would be an illuminating experience.

Watt reckoned it would be a good way to let off steam.

Wilbur Wright accepted, provided he and Orville could get a flight.

Dr Jekyll declined -- he hadn't been feeling himself lately.

Morse's reply: "I'll be there on the dot. Can't stop now must dash."

Hertz said he planned the future to attend with greater frequency.

Audubon said he'd have to wing it.

Hawking said he'd try to string enough time together to make a space in his schedule.

Darwin said he'd have to see what evolved.

Mendel said he'd put some things together and see what came out.

Descartes said he'd think about it.

Newton was moved to attend.

Pavlov was drooling at the thought.

Gauss was asked to attend because of his magnetic personality.