MIDWEST VHF-UHF SOCIETY

Club Memorial Call W8KSE

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

Our **October Meeting** is on Fri. 24th at 7:30 PM at the Perkins Restaurant at SR 73 and I-75.

Contents

Silent Keys
With great sadness we report the passing of these fellow hams:

Stan, K3IPM (63)   (Tom Shutters e-mail Newsletter)
Bruce, K2RTH (59) ("   )

Upcoming:

Leonids Meteor Shower … Double Peak Nov 13 & 19 (see also page 7)

Etc

10GHz Gunn & Mixer Diodes available (see "De N8ZM" on page 3)

Have a nice Fall and get those Antennas mounted before the Winter!

De N8ZM

Well, the weather so far this fall has been pretty decent, enough so to allow lots of opportunities for antenna work and microwave rovering, so I hope all of you have used the time wisely in that regard. If not, don't feel too badly about it, I haven't done much of either myself.

In a recent, and unusual, attack of the neatness virus, friend Daun, N8ASB, was cleaning out his hanger, and discovered several more boxes of the apparently unending supply of radar detectors. Well, actually, only three boxes, which added to the ones I have, amounts to maybe 200 or so units. It immediately struck me (no harm done, however) that we should finish these off by dismantling them for diodes, as before. So, I will be dragging them along to the meeting to see if there are any volunteers to finish these off, once and for all. We still have just shy of 100 gunn diodes, and about the same number of mixer diodes. Hopefully, we can market these quickly, as before. We also have a huge supply of other parts from the previous dismemberment activity, so if you need a source of LED's, pots, capacitors, or 8 volt regulators, call me. Or e-mail. I'll be happy to check the supply and see if we can match your needs. And since the proceeds go to MVUS, the price will be quite reasonable, especially in quantity!

I wish I could say that I have some progress to report on the 900 MHz radio conversion, but alas, I have not been able to find anything on conversion that seems to suit our situation, with making the project more expensive than makes good sense. Anyone have any ideas?

At the last meeting, we discussed the fall schedule for MVUS meetings, and determined that we would have the November meeting on the traditional 4th Friday, which once again is the day after Thanksgiving, so consider yourselves reminded. As for the December Holiday dinner, the only decision was to put off the decision until this month, so that will be one the agenda.

Red, W8ULC, has once again agreed to take on the responsibility for the VHF/microwave forum at Hamvention, and expects to again be assisted by Merle, W9LFE. Red asks that anyone who has ideas for talks, or knows someone who might be willing to make a presentation, to please pass along the info so he can follow up on it and get things in order early. Red and Merle have done a terrific job the last few years in putting the forum together, but they feel that they have run out of ideas and speakers to tap. They are hoping for some inspiration and support from the rest of us. So please pass along any thoughts you have to them.

Another idea festering in my fevered brain is that we should try to spice up the MVUS booth as well. The 10 GHz rigs seemed to work well last year, so how can we expand on that to have something new to show this year. ATV or PSK31 on 10 GHz? A map of MVUS members contacts showing best DX, number of grids worked, etc? How about sponsoring a contest(10 GHz or otherwise) for the members to see who gets the bragging rights for most QSO's, grids, or DX. Has anyone been studying and researching what propagation modes are the most common in these parts? Other ideas are encouraged.

And finally, just a reminder to check your mailing label to see if it is time to get your MVUS dues caught up. We appreciate your support, and hope that you will want to continue to be a part of MVUS. And hey, stop by a meeting sometime. You never know who will be there, and you will meet some very interesting and clever folks in a situation where time to chat is the primary entertainment for the evening. It really doesn't get much better!

73, Tom, N8ZM

This and That 10-03

- **Bright Planets.** For months Mars has been the brightest planet in the night sky. It's still bright, but starting this week Jupiter is even brighter. Jupiter is easy to find on any morning you might wake up early to get ready for work or school. Look east around 6 a.m.; you'll see the giant planet almost halfway up the sky shining like a -1.8th magnitude star. Even a small telescope will reveal Jupiter's cloud belts and its four largest satellites: Io, Europa, Ganymede and Callisto.   [Spaceweather.com]

- **Buttkicker.** This is a gadget that attaches to the leg of a chair or sofa and shakes it at low frequency sounds and impulses. The device has been saving marriages by jolting only people that sit on the chair or sofa rather than creating unbearable vibrations in the air and or neighborhood. This would also make an ideal device to test satellite born gear for defects. The "kicker" doesn't come cheap at almost $ 300. And a special amplifier, if the normal amplifier can't provide enough power, costs another $ 400.

- **Forked Stack.** The last thing you want on a cruise ship is to blow smoke in your passenger's faces. I noticed a newer cruise ship had a y- shaped smoke stack with the smoke (exhaust) blowing out to one side. Obviously a remote valve, controlled by the direction of the blowing wind, diverted the smoke to the side which best carried it away from the ship.   [Wb8IFM]

- **Whopper Field.** Researchers at Florida State University's National High Magnetic Field Laboratory in Tallahassee achieved the holy grail of magnetism recently when their high-temperature superconductor attained the coveted 25-Tesla field strength record

- **Predicting Atomic Energy.** In 1905 at age 27 Einstein wrote "On the Electrodynamics of Moving Bodies". In it he derives the equivalence of mass and energy. …The mass of a body is a measure of its energy content…and … it is not impossible that with bodies whose energy-content is variable to a high degree (e.g. with radium salts) the theory may be put to test.

- **Poisonous Environment.** "Our culture is toxic to children."   And TV is particularly harmful… kids are stuck inside, in front of the TV.   [Child Psychiatrist Dr. Robert Shaw]

- **Navigating in the US.** "You can find your way across the country using burger joints the way a navigator uses stars."   [Charles Kuralt]

- **Aluminum Cans**. Did you know that presently more aluminum is used making cans than is used making airplanes?

- **Space Junk.** Ever since Sputnik, humans have lobbed more than 20,000 metric tons of hardware into orbit. In addition, Dr Ailor notes that the number of operating satellites is expected to grow from 700 today to as many as 3,000 in 2020.   [Amanda Paulson, CSM]

- **Space Projectile.** A small coin hurtling along at 22,000 miles an hour in space hits with the impact of a small bus traveling at 62 miles an hour on earth.   [Richard Crowther]

- **Burma Shave.** Don't lose your head to gain a minute, you need your head, your brains are in it.

- **Are You Happy?** "It's hard to find people who are genuinely happy with their lives, but I found my niche. People need at least 12 hugs a day to be normal, you know. I get many more than that from the people here. That makes me the most blessed person in the world.
.   [Alice Grable, Coordinator for the Deaf at Goodwill]

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 Nemal 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/), 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.

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: <k8ocl@arrl.net>.

Two Nifty Programs.

An inquiry by Bill,W8DMR, who had lost an older program to design horn antennas when fixing his PC, led to two programs at the **SETI League** web site: **www.setileague.org/software/spreadsh.htm** There you find among other software two Microsoft Excel spreadsheets on parabolic dish and horn antennas. The spreadsheet, originally designed more for business and accounting, is indeed very suitable for those type calculations. Their advantage is in the very easy use. You just put in the parameters of your antenna and the frequency, then you can make changes and watch the gain or beamwidth change accordingly. Here are the listings for these two spreadsheets:

13 Dec 1997	parabola.xls	Calculates the electrical performance of a parabolic reflector antenna from specified physical dimensions. Also enables the user to determine focal length, F/D ratio and required feed illumination angle from dish diameter and depth.

18 Jan 2003	horngain.xls	Based upon a BASIC language program published in the 1980s, H. Paul Shuch submits this spreadsheet for analyzing the gain and beamwidth of pyramidal waveguide horn antennas, **given their physical dimensions**. The default values are for the horn built by Harold Ewen in 1951, used to first detect the 1420 MHz interstellar hydrogen emission line

Example Dish Antenna

The SETI League, Inc.   Parabolic Antenna Analysis

User specifies variables shown in   **Bold**

Frequency ==	**1269**MHz;		λ =	23.6cm
Reflector Diameter ==	**1.20**meters =	3.9 ft		
Reflector Depth =	**0.27**meters =	0.9 ft		
Focal length =	0.33meters =	1.1 ft;		F/D =0.28
Feed Illumination Angle =	2.93	radian =	168degrees
= Illumination Efficiency =	**50**%		
Computed Antenna Gain =	1.3E+02	Ap =	21.0dBi
Antenna Half Power Beamwidth =	2.0E-01	radian =	11.61degrees
Minimum Drift Scan time =	4.6E+01	min =	2787.6sec

2003 Leonid Meteor Shower (NASA Info)

This year the shower will have a double peak on Nov 13 and Nov 19:

The first shower is expected on Nov. 13th around 17:17 UT. For about three hours centered on that time Earth will be close to some dust shed by Tempel-Tuttle in the year 1499. Sky watchers in Alaska, Hawaii and along the Pacific rim of Asia are favored. They'll see anywhere from a few to 40 meteors per hour--"if they can avoid the glare from that night's gibbous Moon," cautions Cooke. A good strategy for moonlit meteor observing: travel to high altitudes where the air is clear or stand in the shade of a tall building or hillside.

The second and more impressive shower arrives almost a week later on Nov. 19th when Earth approaches a trail shed in 1533. Sky watchers up and down the US east coast will have the best view. For a while around 07:28 UT (2:28 a.m. EST), they could see more than one meteor per minute. The Moon, a thin crescent on Nov. 19th, won't be bright enough to interfere with the display. (Nor will it be close to the cometary dust stream, so once again there will be no visible lunar explosions.)

Quadrature Sampling Detector (QSD)
By John Ackerman, N8UR

Here's a very quick write-up of the Quadrature Sampling Detector (QSD) that I mentioned at the meeting the other night. If anyone is interested in more details, I strongly encourage them to visit
http://www.flex-radio.com
where you can see information about the SDR-1000 radio, but more importantly download the QEX articles that describe the radio in great detail. There are also lots of other good resources there.

The QSD works much like a direct conversion receiver, but is much more sophisticated (and has higher performance) than the traditional direct conversion circuit. It provides bandpass filtering, has no loss (in fact, it can actually show a gain), and is used in the SDR-1000 radio both as the receive down converter to generate an IF at 11kHz and as the transmit exciter to convert an 11kHz input signal up to the operating frequency. The QSD is based on a circuit called the Tayloe Detector that was published several years ago.

A picture does a lot better than words to describe the QSD, but I'll do my best here in text. It's really a 4-position rotary switch that turns all the way around once each cycle at the RF frequency -- obviously, we're talking about an electronic rather than a mechanical switch here! The switch connects the RF input in turn to four grounded capacitors, which sample and hold the signal. The result is that you have signal samples at 0, 90, 180, and 270 degrees. The 0 and 180 degree capacitors are coupled to the inverting and non-inverting inputs of a high-impedance instrumentation op-amp, and the 90 and 270-degree caps are fed to another op-amp. The result is a pair of signals -- I and Q -- that convert the RF frequency to baseband and are 90 degrees out of phase. The op-amps have such high input impedance that as a practical matter they don't load the capacitors at all, so the circuit has very high conversion efficiency.

The I and Q outputs are sent to the left and right inputs of a sound card, and the computer then demodulates the signal however you tell it to. For transmit, things just work in reverse, with the I and Q signals charging the caps.

An advantage of the design is that the antenna impedance and the capacitance act as an RC network, and the QSD therefore has a bandpass filter built in. You still want some filtering in front of the detector, but the inherent filter can be quite sharp and tracks the RF frequency precisely. In the SDR-1000, the components are chosen so that the bandpass is about 40kHz wide and the IF is centered at 11.025kHz. (By the way, one disadvantage of this design is that if the antenna impedance is not at the design frequency, the demodulator performance falls off. Therefore, it's a good idea to have an amp stage in front of the detector, more to provide matching than to provide amplification.)

I hope this helps explain how the QSD works; I really recommend the articles at the Flex-Radio web site as they give a much better description than I can.

PS -- another interesting point is that by using an IF at 11kHz rather than directly at DC, the sound card provides much better SNR than it does in normal audio work -- using the higher frequency allows all the hum and noise near 0Hz to be filtered out and improves the phase noise.

Merle (Cliff) Rummel, W9LCE needs Help

Merle has been experimenting with the above concept, also known as a "Dirodyne", using a decrepit HB-10 Heathkit rx. He wants to push the operating frequency higher into the VHF range and needs, of course, extremely fast switches. He is thinking of microwave FETs. However, this gets to be beyond his field of expertise. Any suggestions or help in this area would be appreciated. Merle's e-mail: Cliff@rtkonline.com. (Ed.)

222, 432 & 903 MHz Beacons in North America (WZ1V)

```
222.050 W0PW       EM26    MO Neosho      10W to turnstile at 1150' asl.
222.050 WA2UMX     FN23xc  NY Providence  25W + 2 Big Wheels 1620'ASL
222.052 N6XQ       DM12jr                 1W to 6 el yagi pointed north.
222.052 XE2ERD     DM10                   6 el yagi pointed north.
222.053 K0HTF      EN31do  IA Des Moines  Gnd plane
222.055 AA2UK      FM29    NJ Elwood      10W to KB6KQ loop @ 300'
222.055 VE1SMU     GN03       Sable Island 10W to 5el yagi to west
222.055 W6TOD      DM15dx  CA Ridgecrest  20 watts pair Bigwheels 2400' asl
222.056 N8PUM      EN65bx  MI Felch       1W to PAR horiz. omni 1400' asl.
222.057 VE1SMU G   FN74os  NS Lake George 10W yagi pointed WSW
222.057 VE1SMU SAGN03       Sable Is?     10W 5el to west heard 7/27/02
222.057 WD4GSM     EM86    VA Wise        300mW to turnstile at 4200' asl
222.058 W2RTB      FN12    NY             10W+eggbeater @450' asl.
222.060 AA5C       EM13se  TX DFW         8W to dipole @ 45'
222.061 W0ZQ       EN34it                 18W to turnstile @ 60'.
222.065 W3CCX      FM29jw  PA Philadelphia 4W to single loop @ 435'
222.070 K3DEL      FM28fn  DE             2w yagi beaming NE
432.078 WD4GSM     EM86    VA Wise
432.180 K0UO       EM07sa  KS Kiowa       3W  1810' AGL
432.295 W3CCX      FM29jw  PA Philadelphia 5W to Big Wheel @ 435'
432.299 W2UHI      EN63vb  MI Grand Haven 10W omni
432.300 K6ER       CM87sv  CA Sausalito   2W horizontal 1125' amsl.
432.300 VE1SMU SAGN03       Sable Island  8'dish to west - heard 7/27/02.
432.300 VE4ARM     EN09jw  MB Austin      20W to 3el yagi @ 53' to SE
432.300 W4CHA      EL88    FL             25W to bigwheel on broadcast tower
432.303 KW2T       FN13                   0.25W FSK
432.306 W2RTB      FN12    NY             15W+Eggbeater @450' asl.
432.307 WA4PGI     FM07bw  VA Covington   5W+crossed dipoles,+/-5KHz
432.309 WA4ZTK     EM85ar                 0.9W+yagi to northeast
432.310 NE8I       EN82jm  MI Beverly Hill Temporary?
432.313 K7RAT      CN85ss  WA Battleground 200mW to horiz loop @ 30'.
432.313 W3VD       FM19ne  MD Laurel      7W+turnstile QSL N4GYN
432.315 K4DOS      EL96we  FL Ft Lauderdal 20 watts H. Loop @ 30'
432.328 VE2CLO     FN35    Montreal       10W + 2x12 yagis south/west
432.339 VE1SMU/H   FN84    NS Halifax     per K1GVM & WZ1V
432.347 WD4GSM     EM86    VA Wise
432.348 VE1SMU G   FN74os  NS Lake George 10W yagi to WSW heard 7/27/02
432.350 K0HTF      EN31do  IA Des Moines  J-pole
432.355 N8PUM      EN65bx  MI Felch       5W Turnstile @ 1400 ft elev.
432.360 K0RZ       DM79jx  CO Boulder     2W 10dBi N and 2W 10dBi SE
432.360 WD4MBK     EM74tm  GA Jasper      10W eirp K4NHN slot at 3320' asl
432.380 W5HN       EM13kf  TX DFW         0.5W to square loop @ 280'
902.345 VE1SMU     GN03       Sable Island 7W 2bay horiz. pointed west
902.380 W5HN       EM13kf  TX DFW         6W to Alford slot @ 280'
902.550 N2NEP      FN13da  NY Henrietta   10W + Big Wheel
902.989 KA8EDE     EM89ap  OH Xenia       5W to dipole @ 90', 985' asl.
903.016 WD4GSM     EM86    VA Wise
903.050 W3VD       FM19ne  MD Laurel      QSL N4GYN
903.055 WA1ZMS     FM07fm  VA             100W to Turnstile 4200ft AMSL
903.060 K1TR       FN42iv  NH Derry       10W bigwheel @ 100'
903.071 W3CCX      FM29jw  PA Philadelphia 5W to Littlewheel @ 435'
903.084 K3DEL      FM28fn  DE             8w looper beaming NE
903.085 K3SIW      EN52bx  IL Schaumburg  30W to corner refl aimed East
903.300 VE1SMU/G   FN74os  NS Lake George 10W yagi pointed WSW
903.310 VE2CLO     FN35    Montreal       10W + corner refl. 10dB SW
903.704 WD4MBK     EM74tm  GA Jasper      5W eirp W4ODW Big Wheel 3320' asl
```