



Vol. 13 No. 9

[www.ceitron.com/mvus/mvus.html](http://www.ceitron.com/mvus/mvus.html)

Nov. / Dec. 1999

**November Meeting:** Friday, the 26<sup>th</sup>, at 7:30 PM  
**December / Family (after Christmas) Meeting:** Wednesday, the 29<sup>th</sup>, at 7:30 PM  
Both Meetings at the the Perkins Restaurant at SR 73 and I-75.

### Contents

De N8ZM.....	3
This and That.....	4
State of the Art in Home Brewing .....	5
300 W Wideband Amplifier .....	6
MVUS Member List by Suffix*.....	7
Trying out OSCAR Zero.....	9

**Upcoming Event: 2<sup>nd</sup> EME-Contest Weekend: Nov. 27/28**

Check out our **new Beacon on 902.98 MHz**. It's located at the QTH of KA8EDE (EM89ap).  
Nine watts are radiated from a horizontal patch antenna at 90feet.

### British Microwave Handbooks For Sale.

The club has a few sets of the 3 volume British Microwave Handbook, edited by M.W. Dixon, G3PFR, for sale to its members. Cost is \$ 50.- + \$ 5.- for shipping. Contact Gerd, WB8IFM.

Also available: **UHF Compendium** ( by Karl Weiner), two volumes: Part 1&2 and Part 3&4,  
\$20.- ea. + \$ 5.- shipping

### \*New List

The list printed in the June/July issue was peculiarly sorted. The new updated list is sorted by suffix as in the past. Please check for accuracy and drop us a note if something is amiss. Also, there were issues lost in the mail and labels had come off. If by the end of the month you have not received your copy, drop us a note and we mail another one.

**De N8ZM** At our last meeting, we decided that the annual holiday dinner party would be held on Wednesday, December 29th, 1999 at 7:00 at the Perkins Restaurant in Springboro. Our usual 4th Friday turned out to be Christmas Eve, and I brilliantly concluded that the turnout might be quite low as a result. Of course, the dinner meeting is for family and fun, rather than our usual level of decorum, so remember to tell the better half to put this event on the family calendar.

For our November meeting, bring along a few things you'd like to sell or swap, as well as your Christmas list of VHF/UHF/microwave toys. Also bring along, in your head, a short story about some memorable or inspiring event in your amateur radio experience. We all have a few experiences that are special to us, and this will be a chance to share them. Maybe it was your first QSO, or a story about someone who holds a special place in your memories, or ???. If you have any pictures or some memento, please bring them.

Bruce, KA8EDE, now has his 902 MHz beacon back on the air from EM89ap (for you locals, that's just south of Xenia). The antenna is a patch at 90 feet. Actually, the whole beacon is at 90 feet, with the patch mounted on top of the equipment enclosure, much like the 1296 beacon he has built for MVUS. The frequency is about 902.970 MHz, depending on who makes the measurement. Power to the antenna is 9 watts, if I remember correctly. By the way, the 1296 beacon is almost ready to go, as soon as we get the ID'er ordered and installed. The location will be on a water tower on the southeast side of Wilmington. Once I determine the exact coordinates, I can figure out the 6 characters of the grid square and order the ID'er, and we'll be ready to put it on the air!

Some things to think about during the year 2000:

1. The Y2K hoax will be forgotten, even by comedians;
2. The real Y2K problems, if any, will probably still be with us;
3. The ARRL Great Lakes Convention will be in early March;
4. Hamvention (the VHF Forum is still not certain);
5. What does MVUS want to accomplish this year?
6. Will I ever get all my projects done?

Last year, we had a very well attended tune up session in May. Would you like to do it again? What measurements would you like to make? Let me know so I can start planning soon.

MVUS still owns a lot of radar detectors in various states of completion. The club treasury has benefitted nicely from the sale of these, but the market for them as is has probably been pretty well milked. I propose that the value in them now is in the components on the boards. We still have a lot with the older two board design and many larger discrete parts such as pots, LED's, Gunn and varactor diodes, IC's, 8-volt regulators, etc. We also have a number which are built with higher levels of integration and surface mount parts. I think that we could set up a production line of sorts for a day to recover a large portion of these parts to sell to members or in a flea market space. A few hours with the right tools (Bruce's blowtorch?) and we should have a large number of useable parts. AND, my garage and Daun's hanger would have more free space for new acquisitions! I'm thinking that sometime in February would be good to get together for this, so be forewarned.

Also, there are still a few of the Quintron 4-400A VHF low band amps available, if anyone is interested. They are very well built and could be tuned for 6 or 10 meters.

Many of you may have heard that my employer, HP, has decided to split into two separate companies. The computers and printers biz will keep the HP name, but the measurement businesses will become Agilent Technologies, effective November 1st. As a result, my e-mail address has changed to: Tom\_Holmes@Agilent.com. The old address will forward for a few months yet. No change in my job, just in the name over the door. Happy Thanksgiving! Merry Christmas! And a Prosperous New Year! Tom, N8ZM.

# The State of the Art in Home Brewing

By Jack Mitchel, AA8Q and Gerd Schrick, WB8IFM

Hams are not building as much as they used to. The reason: more equipment is available and at the same time it is getting more difficult to home-brew. Parts are getting smaller, which is an advantage at the higher frequencies but requires very good eyes, a steady hand and possibly special equipment. Solid state components have the advantage of low voltage operation but are not as forgiving as the tubes were. Circuit tolerances are tighter and all components ought to be checked and if possible measured before soldering them in.

Still, great advantages are in home brewing. One can use better (choice) parts than the manufacturer and one can tailor the equipment to one's specific needs. Moneywise, not counting your time, of course, you are almost certainly ahead. And, if you are into microwaves, a lot has to be built, as it is not generally available. As a minimum you have to interconnect and adapt some often intricate individual building blocs into a useful working set-up. This is made harder as most new equipment practically has to be used "as is". Since even the slightest modifications are very, very hard to make. Once I just tried to change the microphone connector to make it conform with my other rigs, but I gave up when I saw what was involved.

When you see a desirable design in the handbook or in QST you have to realize that this is a "one time" piece of gear. It was designed, built, it worked and it was written up. The last thing you want to do is, build a "chinese" copy of this. This is what you do, when you build a kit. All you learn there is to follow instructions and how to solder. So this approach w/o the benefit of the "kit seller's" instructions most likely will not work. There are just too many things that can go wrong. You need to acquire a thorough understanding of how the design works. With this will come the insight of what it really is that makes this design attractive and you will be able to modify it to your advantage. The result will be what you want and feel is "the best", and the satisfaction over a well functioning piece of gear will be your reward.

Before you start, *all the parts* should be collected. That's where hamfests and fleamarkets have a real purpose. Of course, the usual parts houses can be searched and lately there is the Internet. If you know how to search on the Internet, it is amazing what you can find! A chassis used to be on the top of your shopping list, nowadays it is not recommended, rather build the entire box with functional modules inside. It is sad that ham equipment is NOT build like this by the manufacturers, the building blocs on the schematic are "fictional". Once I considered to remove the "frontend" from a 1296 "radio" to mount it remotely at the antenna. I had to abandon this idea, as the

components etc were scattered over the entire chassis. I have no idea as to why they build things like that. Also at one time I special ordered a separate VFO for a shortwave transceiver. What I got was the whole chassis but with just the VFO built in. I had to haksaw the superflous parts off to cut it down "to size". There are a few companies that still provide some basic kits like Ten Tec and Down East. And there is also Communications Concepts, CCI, which almost singlehandedly is selling Motorola VHF/UHF products. Modular construction is the way to go and these kits (some can be purchased assembled) and/or parts are a great help for the home brewer.

What do you need in terms of tools and equipment? Well, it is nice to have a "full service" machine shop available, but it is not necessary. A good set of the usual household tools, plus a set of finer screw drivers, small pliers of different design and a small drillpress with a good set of drillbits will do. Good illumination and a lamp with a magnifying lens helps a lot. For a soldering iron, the type with a thermo sensor at the tip and temperature control is recommended. They cost more (\$150 to \$200) than the usual ones, but are well worth it. In terms of equipment (besides the usual VOMs, PWR/SWR meters etc) you should try to get a decent oscilloscope and signal generator. Finally, find out wether there is a local group that stresses homebrewing and join up. You will get to meet like-minded people, that can help you with advice, equipment, and measurements that are normally beyond the means of individuals.

Another important thing for home-brewing is documentation. Don't save on paper! When you are young, have a good memory and keep with the project all the time you may not need this. But we usually have lots of items on our mind, and we cannot spend *all* the time on *our* project. So, documentation IS important.

Finally: plan for the future. Make your design *service friendly* because it will not be final! You will go through several iterations until you finally reach your goal and are satisfied with the performance. Well designed and built home brew equipment will easily outperform commercial stuff. For the best receiver performance at VHF/UHF and higher nothing beats an HF rig. The VHF/UHF allmode rigs are not as good or versatile.

## Solid State HF/VHF Power Amplifier.

CCI offers a variety of solid state devices by Motorola, as well as circuit boards and passive components to go along. Multiple transistors in power amplifiers need to be matched, which makes for expensive replacements in case one transistor goes bad since the replacement must be a matched pair, triplet etc. Most of the amplifiers are wideband and would need a low pass filter at the output to suppress harmonics.

A single MOSFET transistor is used in a 300 W amplifier spanning 10 to 175 MHz. On 144 MHz only 6 Watts of drive to obtain full power output is needed. High voltage devices are preferable unless you are using an automobile's 12 Volt system. That way the current is much less and more manageable. For example, the MRF151 in that circuit can be fed with 48 Volts. At that voltage the maximum current (at 65% efficiency) is under 10 A. The transistor needs a large copper plate as "heat spreader" which in turn is mounted to a larger yet heatsink (xvz) with 1" fins. For SSB or CW no additional cooling, as by fan, is required. The amplifier is described in Motorola's application note 305. This is a well proven design and is often used as a driver in commercial TV transmitters. Following some graphs from the appl. note

MRF 151G

### TYPICAL CHARACTERISTICS

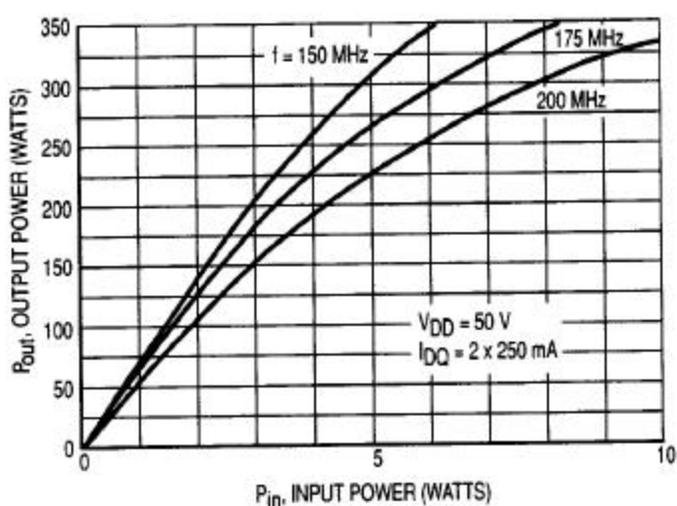


Figure 7. Output Power versus Input Power

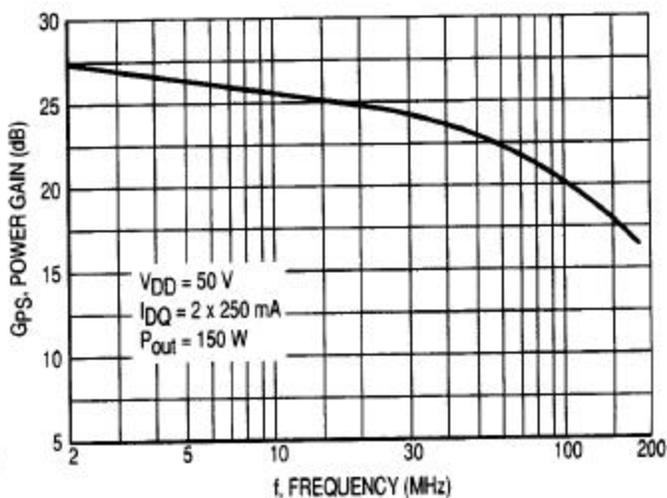


Figure 8. Power Gain versus Frequency

### End of Year Reflections: What a Diversified Bunch

At the Jan 29-99 meeting Tom, N9ZM spotted some new faces, so he asked everybody to stand up, introduce himself and tell us briefly what their particular interest was.

There was one EMEer, several satellite people, a few terrestrial dxers, one guy who mostly builds and does not care much about operating, even somebody admitted to use nothing but an HT, at least at the moment, and one that is deeply into scouting. There are other things that escape me at the moment. But it is, like almost no two guys do the same thing. [Gerd, WB8IFM]

# Trying out OSCAR Zero

By Red Dakin, W8ULC & Gerd Schrick, WB8IFM

EME takes some serious efforts on the part of the operator both in equipment and in the persistence to set it all up, check it out and get it to work. In a handout about Amateur Radio Satellites I called it the ultimate achievement of a ham (akin to visiting Mecca for a Muslim).

One band that is particularly suitable and attracts a lot of attention for moon bounce is 23 cm. 13 cm actually might be better yet, if it weren't for the fact that internationally the frequency allocations differ and that it's more difficult to generate sufficient power.

John, WA9OUU, has been building up his 23 cm EME station for over one year now, and he invited us to see it and check it out during a recent EME contest weekend (Oct 30 & 31<sup>st</sup>).

John had introduced a new amplifier, which we call the "octopus", at the Dayton Hamvention. The amplifier, which has eight 2C39 types in parallel, cranks out a cool 800 W. Together with his 15 foot dish his station now qualifies as "upper middle class" (hi). He can hear his echos real well and an occasional SSB QSO is possible.

We got to his place in the country at 11PM in good time to marvel at the stars in the clear sky. A sight like this is rare for anybody living in or near a city. The moon was not to rise for another hour so we could look. The Milky Way was partly visible and we could identify a number of the well-known constellations.

Next we went inside and John explained the station layout and the operating procedures. The station was uncluttered and well arranged. An MFJ keyboard type keyer was used, which sometimes displayed a mind of its own; it would add characters by itself and sometimes lose its memory. As we found out later, it didn't like the "high power environment". We tried to listen by head phones but found this to "restrictive"; so we went back to a speaker. While Red and I manned the station, John was keeping an eagle's eye on the tracking program and the power amplifier: a true "multi op" operation.

It was after midnight, when the moon came up. However, we had to wait till it was about 15 degrees above the horizon because a corner of the house and some tall bushes were shading the dish. Then the first signals appeared and the first contact with HB9BBD was made. This was one of the 23 cm "super stations" with a 33-foot dish and 2 kW. All activity takes place between 1296.000 and 1296.030. That way you have not too far to look. On the other hand there is occasional QRM.

The EME people are truly an exclusive club. John gave us a list he had gotten from a DL with all the 23 cm EME stations of the world that were active in 97/98. I counted a few over one hundred. Their power ranged from 20 W to 2 kW and the dish

sizes ranged from 8' to 43' feet in diameter. How do you figure out where the station ranks; you multiply the power at the feed with the gain of the antenna; this will give you your PEP. The PEPs range from several hundred kW to many thousands of kW.

All three of us, being mediocre CW operators, had a hard time coping with the 99% CW environment and it would take us all the repetitions we could get to make out calls etc. Normally in a contest all you are interested in is the call and the report. But this was not a normal contest. Operators were considerate to the extreme: greetings were exchanged like gm, 73 and other niceties. That, actually, made it more difficult for us!

We made one phone QSO with N2IQU and were surprised by the audio quality. Also the CW tones were extremely clean, definitely T9. However, peculiar fading could change characters. Typically a dash would be broken up into one or two dots.

The moon was over the middle of the Atlantic and time was good to work into Europe. We worked stations in HB, F, ON and heard some others. After chasing stations for quite a while, we got enough courage to call CQ with good success. The keyboard permitted to be preprogrammed with the usual QSO phrases. So we had in there: CQ CQ CQ, de WA9OUU WA9OUU, 73, 44N, 55N, 5NN, K K K and SK. Notice we were using N for 9.

John kept reminding us to correct the transmit frequency for Doppler, which is around 1 to 3 kHz and is negative when the moon approaches and positive when he is receding from you. A quick check, transmitting a few characters, then switching to receive. If you heard the echos, the frequency was close enough. But you wouldn't believe how often we forgot to adjust the TX frequency.

Another fact you have to get used to is to wait for the other station to reply. Let's assume your last dash (from the K) is transmitted and you switch immediately to receive. Your partner hears this last dash and starts w/o delay with his reply. It takes a minimum of 5 seconds before you hear it, but it is usually longer than that. So patience is another required virtue of the EMER. I guess they are also quite forgiving if the other guy has trouble with the code. They might actually be similarly handicapped and/or using a hellish keyboard machine themselves. In fact, most code sounded utterly "perfect" as only a machine could produce it, which in my experience is not the easiest to read. It has a similar effect as an artificial voice, which is hard to understand.

Around 4 AM fatigue started to show and soon we decided to leave to get home and catch a little sleep yet. We had the time of our lives and enjoyed thoroughly doing EME from Central Ohio at John's WA9OUU.