MIDWEST VHF-UHF SOCIETY

Vol. 14 No. 1 www.ceitron.com/mvus/mvus.html **January 2000**

January Meeting. Friday, the 28th, at 7:30 PM at the Perkins Restaurant at SR 73 and I 75.
Meeting Topic: TBD

Contents

Merle Rummel, W9LCE, underwent surgery. He should be out of the hospital and recuperating by now. We wish him a speady recovery!

Upcoming Events.

Great Lakes ARRL Convention / Cincinnati……25/26 March

Dayton Hamvention / ARRL Natl. Conv.…..…19/20/21 May

De N8ZM

The Holiday Dinner Party was a nice pleasant evening for all who attended, a group I estimated at about 25. Lots of good conversation, not all of it about radio! A nice lead in to the New Year, and depending on whom you ask, maybe the new millenium! Frankly, Scarlett …… But I digress. With the New Year come a few changes to Anomalous Propagation. Bob French's ongoing health problems have forced him to retire from his post as Co-editor, as well as club secretary. Bob has contributed greatly to the quality and content of this publication for many years, including suggesting the name Anomalous Propagation. Hopefully, Bob will still contribute to Anom.Prop. occasionally. I will certainly miss his parenthetical jabs inserted into my column. Best wishes to you, Bob, and thanks for all of your contributions to the success of MVUS, they are numerous.

The next change is that Steve Coy, KB8UHY, will fill in for Bob as Co-editor, a role he has been dabbling in for the last few months. Steve also created and maintains the MVUS website, and handles any e-mailings that go out. Steve is a very active guy, and I am sure that he will be appreciative of any assistance you can offer. Welcome aboard, Steve!

By the way, this newsletter exists to communicate your ideas and experience and knowledge to the rest of the group, so don't be bashful about writing up a description of a project, or even an opinion piece. I'm NOT the only one allowed to shoot off their mouth in this club, and I will cheerfully relinquish this space to anyone who has something to say. Send your piece directly to Gerd for publication. He likes e-mail documents, and he's fond of WORD. Gerd is also planning a Q&A column, so if you want to know about something technical or MVUS related, drop him a line.

Gerd also tells me that the newsletters will be folded differently to comply with USPS requirements. Seems the sorting machines get paper cuts when the crease is on the bottom.

I have ordered the IDer for the 1296 beacon, and I expect it to be in KA8EDE's hands within 2-3 weeks. It should be just a short time after that when we will have it on the air. The grid square is EM89bj (bravo juliet).

The latest word on the VHF forum at Hamvention is that we have gotten our Saturday slot back, but will be located at the High School. There will, as usual, be buses running to there from the arena, so there is really no excuse for not being there. Even with the traffic, the bus trip is only 10-15 minutes at most, and they run quite frequently in order to service all the activities held at the school.

Bruce Lundy, KA8EDE, has found a new RF brick that looks interesting. It is a 4 watt LINEAR module for 2.3 to 2.4 GHz, requiring only 20 mW of drive. Power supply is 10 volts at a little less than 1.5 amps. Manufacturer is Phoenix Microwave. The part is a bit pricey in singles ($150), but if we buy more than 3 we can get it down to $130, thanks to a sympathetic distributor. Bruce plans to use one in our 2.4 GHz beacon, and he wants one for his own use, so we just need one more interested party to get us to three. Call or e-mail me if you are interested. Yeah, I know that it's a ton of bucks, but consider the cost and effort of homebrewing an amp with the same specs! If I know Bruce, he will come up with a design that can be easily reproduced, even by me!

A quick survey of the members attending the dinner determined that March would be a good time for our tune up session. I suggest the Saturday before our 4th Friday meeting in March at my place. That's March 18th, which doesn't interfer with the Cincy hamfest, which is on 25/26 March. So far, I've had requests for noise figure and receiver dynamic range measurements. If requested, we will also set up for antenna impedance measurements. If there are other needs, let me know soon so I can try to make the necessary arrangements. I need to know the frequencies, as well, of course.

We sold a number of the small radar detectors this week, but we are still in possession of a quantity of the older two board models. I am still hoping to organize a scavenging session for late February (maybe the 19th), provided my travel schedule doesn't get much more complicated. I'll have a proposal at the meeting.

Just a reminder, it is probably time for many of you to kick in the annual $8 dues. That's a real bargain in terms of the cost of just publishing and mailing a newsletter, not to mention the value of the information content. Throw in the comradery of over 100 fellow VHF and microwave enthusiasts, and it's a better return than a .com stock!

Tom, N8ZM.

This and That 1-00

- **Communicating With Our Planets**. We know it takes 2 ½ seconds for an electromagnetic signal to make it to the moon and back. So after you end your trandmission the soonest you can receive a reply is twice that time or 5 seconds. Light from the sun travels for 93 million miles before it gets here which requires eight minutes. This tremendous distance is called an astronomical unit or AU and it brings interplanetary distances down to manageable numbers. Pluto, our most distant planet is 39.5 AUs away from earth and signals travel for 5 ½ hours to get there. Saturn is at 9 to 10 AUs (distance varies) and timewise about 80 minutes. [Ed.]

- **Hole Through Firewall**. Ray: " …just go ahead and drill a hole, but be carefull not to, say, drill into the heater core, you won't do any damage to the vehicle by making another hole in the firewall. Just be sure to fit a grommet into the hole before feeding the wires, so the wires don't chafe and cause a fire." Tom: "And speaking of fires, if you do run your own wire, be sure to put a fuse for it as close as possible to the battery. … I know you ham radio guys love responding to fires and emergencies, but you probably prefer that they not be your own." [Click and Clack in Car Talk]

- **Electronic Movement.** The car boom box has been with us for some time. Back in 1990, at the winter Consumer Electronics show in Las Vegas, Pioneer Electronics unveiled its sports car called Gemballa Mirage. The car featured a 2,100-watt sound system, 24 speakers, a color TV monitor, videocassette recorder and a tp speed of 270 mph. [newspaper]

- **The Good Old Carburator.** Having carburator troubles? Hear some advice: Poke around some garages. And when you find an old geezer with his teeth soaking in a glass of carburator cleaner on his workbench, you'll know you've found your man.

  [Tom, Car Talk]

- **What Is Advertising?** The science of arresting human intelligence long enough to get money from it.

  [Stephen Leacock]

- **Paper Statistics.** 12,000 sheets are used yearly by the average office worker. America uses 30% of all the paper in the world and recycles 57% of it. [Time Mag.]

- **Internet Shopping.** How does it work? Simple, from your mouse to your house!

- **Surfing Can Be Frustrating.** Searching hundreds of Web sites, many, if not most were found to confront the searcher with various kind of detours, dead ends, labyrinthine pathways, complicated menus, and other obstacles to the nuggets of information needed by the design engineering community…[Joseph Del Gatto]

- **Battery Backup**. Many volunteers that spent the transition from the old to the new year 2000 (Y2K) at the various Fire, Police and other City Departments had been stocking up on ordinary Alcaline batteries just in case. Why not get all the usual Nicad battery packs charged up and depend on those? Because they just cannot be depended on! Their fame is just about as good as that of a fruitcake and for the same reason. In order to cut cost, both lost all that was good about them. [Ed.]

- **Need an Antenna Support?** The common bamboo of Japan – Ma-dake – grows four feet in 24 hours. No plant grows faster. [Boyd]

- **Miles and Miles to School.** We walked many miles to school, and school wasn't cancelled when snow fell, as it is so often to-day. That's why we learned how to spell and speak proper English. We didn't need software. [Garrison Keiler]

- **Moon Rise.** Before electric lighting, almost every grownup on earth knew that the moon rises about 50 minutes later every night then the night before … Now only the EMEr knows (hi). [Boyd, Ed.]

Microwave Update 1999 Proceedings

The conference was held October 22-24, 1999, in Plano, Texas.
Proceedings are available from Down East (908) 996-3584; cost is $20, plus $6.- shipping
This is a **big** book, 1.2" thick and weighs over 3 lbs. Following the contents:

New Directions for Batteries

By Gerd Schrick, WB8IFM

A battery consists of several cells, which are usually connected in series to provide higher voltage. This higher voltage is especially needed to provide power for mechanical devices and in our application power for the transmitter. A higher voltage also means usually higher efficiency. Automobiles, which at one time used 6 V batteries went to 12 V batteries, doubling the cell number from 3 to 6. Big trucks and the military are using 24 or 28 V systems and efforts are now underway to once more change the automotive battery, this time to 24 V also. Apparently the lead acid cells used today, can now be sufficiently uniformly produced, so that a string of a dozen or so cells causes no problem for the many charge/discharge cycles in a car. And this is done in a pretty severe environment of varying temperature and vibration.

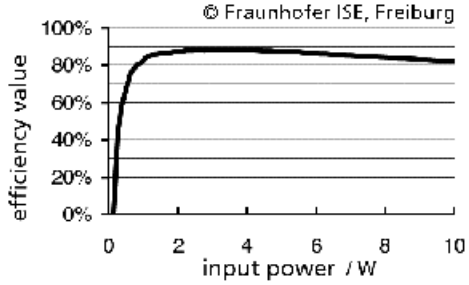
A totally different situation exists for the NiCad battery. From day one, nobody ever got the number of cycles, the usual number given is 1,000, out of a battery. This might, however, work for an individual cell. This fact gave cause to a lot of myths why this is so. The poor battery is supposed to have a "memory", you should always completely discharge the battery before recharging or you should never discharge the battery more than to 1/3 of its capacity. While all these attempts to explain the NiCad battery have a tiny grain of truth in it, they can be only classified as mostly vodoo. But what are the reasons for this failure. First the voltage of a cell is lower; only 1.2V versus the 2.0 V for the lead acid cell. So more cells are needed. Next there are variations in the capacity and charge and discharge characteristics that are severe enough to discharge some cells faster then others. This creates the problem that a cell with an early discharge starts a reverse charge, which destroys the cell.

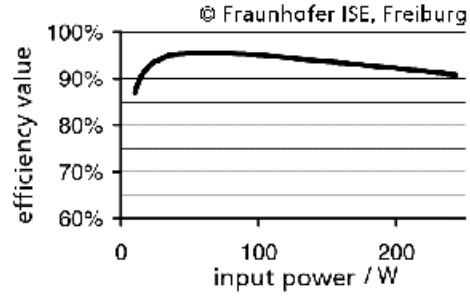
There is a way around this, which involves testing a lot of cells, running them through several charge and discharge cycles and sorting them to create a string of lls that have essentially the same characteristics. This, of course, is time consuming and, depending on the set-up, labor intensive, in short ***very costly***. However, in applications as in satellites, where the top performance of a battery is important, this is done.

Let us now look at a somewhat unorthodox arrangement of a battery where cells are connected in parallel. The voltage is, of course, limited to that of a single cell, but as the current availability is increased proportionally, the same amount of power can be delivered. For the higher voltage applications now a converter has to be applied, and up to now, low voltage and high current has meant high losses. However, progress in semiconductor technology has now made it possible to build such converters with efficiencies approaching 95%. By connecting cells in parrallel a cell that fails no no longer will influence the functioning of the remainig cells, it will simply cease to contribute while the other cells continue to do so. This arrangement is all the more of great interest as other energy generating devices such as solar cells and filel cells only generate low voltages between .5 to .8 V.

Researchers at the Fraunhofer Institute for Solar Energy Systems have demonstrated this new technology. By using new circuits with especially selected components they built several prototypes converters which exhibit the high efficiency required for this application. As an example, they built a 1.4 V to 350V converter delivering 300W with 90% efficiency and a 10 W converter which transforms steps up the voltage from .7 to 12V.

So it looks like that sometimes in the not so distant future we might get liberated from the troublesome series connection of cells in batteries, and we finally will get the promised 1,000 cycles for our nicads.





What if the Cable breaks?

Early on, light promised to be the electromagnetic choice for really wide bandwidth, and with changing atmospheric conditions it was suggested to send it through subsurface tunnels. Well, we did one better and developed the fiber waveguide. The bandwidth of a single fiber, which is the thickness of a hair ($2/_{000}$"), is so wide, that the limit presently is set by the terminal equipment, as is the cost. Most of cable TV now is through fiber , and only the connection to the house is coax. This gives better pictures and cuts down on interference from and to the cable.

However, with our dependence on cables it is frustrating when the network goes down even briefly. A natural disaster – an earthquake could knock out a buried cable for days. What can be done in the meantime to restore bandwidth? Lucent Technologie's WaveStarOpticAir System maybe the ideal bandaid. Capable of handling any network traffic, from computer data to telephone calls, OpticAir employs laser light to bridge physical gaps of up to several miles in optical networks. The use of this technique for emergency, however, is not the only one. "Imagine a company rents two office spaces in a skyscraper, one on the 40^{th} floor and one on the 80^{th} – they could use this system to beam high capacity signals up and down the building w/o having to pull cable through the ceiling," says Gerry Butters, President of Lucent's Optical Networking Group. The price of such a system, he estimates, will be comparable to that of a traditional fiber-based system minus the cost of the cable.

Each mailbox-size OpticAir unit houses a diode laser, amplifier and receiver that will operate at speeds up to 10 gigabits per second, outshining the bandwidth of current wireless radio technologies by a factor of 65.
This line of sight solution is, of course, subject to atmospheric conditions, in particular heavy fog can interupt the link, still one and one half times the "visibility" can usually be achieved. Additionally, a lens spreads the beam, preventing data interuption caused by birds breaking the beam. Meanwhile high winds are compensated for by a small tracking laser that feeds data back to alignment motors inside the unit.

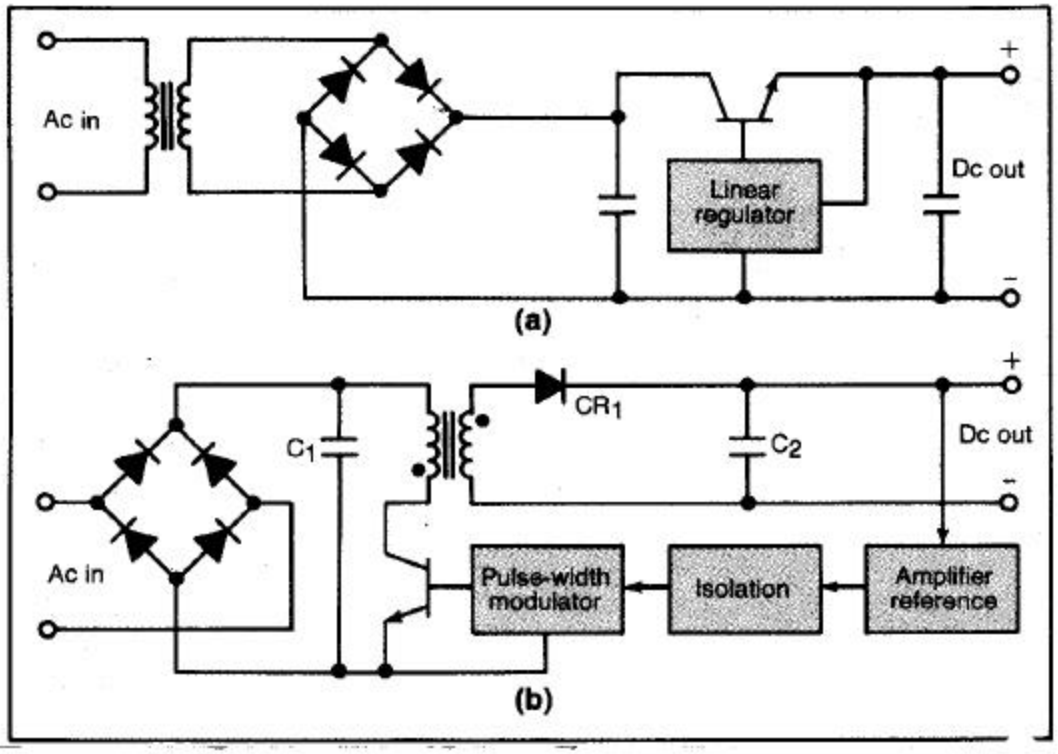
A test connection earlier last year between the US-Navy port of San Diego operations building and an aircraft carrier bobbing with the tide more than 200 yards out was nearly continuous for a month and a half.

The technique is actually nothing new and systems have been built and tried in the early 70s; nothing, of course, approaching the present bandwidths. Ironically, Lucent's stock certificate depicts Alexander Graham Bell's photophone, an 1880s predecessor to OpticAir.

[condensed from the Scientific American, Dec 99]

New 47-GHz Record

* **New 47-GHz North American Distance Record Claimed**: KF6KVG and W0EOM are claiming a new North American distance record on 47 GHz. On December 8, after some testing and waiting for the right day, W0EOM went to Mt Vaca, (CM88WJ) near Vacaville, California, and KF6KVG went to Loma Prieta Mountain (CM97BC), south of San Jose. They calculate the distance to be 137 km. At about 2:15 PM they acquired signals about 1 S-unit out of noise. Approximately 10 min later, KF6KVG found he was on a side lobe, and signals jumped up to S8 on both ends. Both used 23-inch dishes. Weather was 50 degrees, humidity about 60 percent, and high clouds. [ARRL , Dec 99]



1. The analog, or linear, method (a) uses a dissipative transistor to regulate the dc output voltage or current. The digital, or switch-mode, method (b) regulates by adjusting the pulse width of a square wave derived from chopping the dc rectified from the ac power mains. The regulated pulses must then be rectified again and filtered before voltage can be delivered to the output.

What's in Store? Or these New Engines

From Professor *James D. Halderman's Column in "Wheels".*
He teaches Automotive Technology at Sinclair Community Collegein Dayton OH

H: Another major change that's occurred in the last few years is the switch from distributor-type ignition systems to a distributorless ignition system. Most of today's engines use a coil-on-plug design that eliminates spark plug wires and attaches the ignition coils directly on top of the spark plug. Two primary wires, controlled by the computer, carry 12 volts of power from the battery to the coil, which then steps up the voltage to about 40,000 volts, to fire the spark plug. ***This distributorless ignition not only eliminates the need for the distributor but also the high-voltage spark plug wires that could interfere with the vehicle's computer and electronic systems.***

What about future trends for engine development?

H: I think the major change will occur when the ***42-volt electrical system*** is implemented. This will allow the water pump to be powered by a small electric motor that only operates when needed. It also would eliminate the accessory drive belt because the power steering will be electrically powered and will not need a drive belt to power the hydraulic power steering pump. The air conditioning compressor can now be electrically powered and combined with an electric drive motor in a sealed contained similar to what is being used in household refrigerators and freezers. This sealed unit could then be placed at the rear of the vehicle to help with weight distribution and get it away from the heat of the engine.

13cm Multiple Tube Power Amplifier

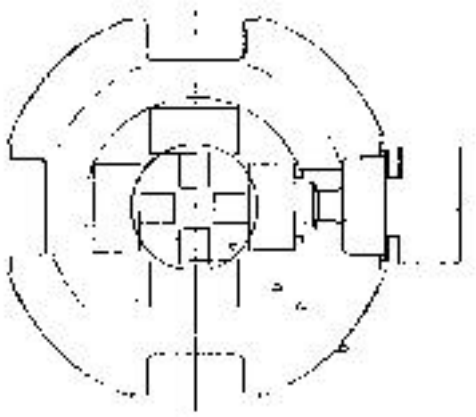
By John Berker, WA9OUU

Having gotten my feet wet on 23cm EME, I am now planning to add 13cm to my EME operation. Using the same 4.4m TVRO dish, construction of a circular polarized feed horn will use a combination of published waveguide and choke designs.

Entry level power requirement for 13cm EME is about 100W and can be achieved several ways. Single 7289 tube amplifiers like the ones Ed Krome, K9EK, builds, put out 65W, which could conceivably increased with a higher voltage power supply. My *TRC29* cavities produce 60+W and a pair combined with a hybrid coupler could double this to 120+W. Ed, now experimenting with the Russion tube GS9b, tells me, he's getting close to 150W with a single tube, which sure could boost EME activity at the entry level.

My current project is a high power 13CM amplifier for EME use. It will be similar to the 23cm amplifier in use now. This, to refresh your memory, is an eight tube amplifier (which Gerd, WB8IFM named the **octopus)** generating close to a kW. Building this amplifier was a good learning tool for designing multiple tube amplifiers. This unique design uses eight 7289 tubes. The axial placement of those on a single coaxial resonator produced near single tube efficiency and trouble free operation at full power output.

The 13CM prototype will use four 7289 tubes and if it is successful, I will try expanding it to 8 tubes in a push-pull configuration retaining single tuning and rotating loop output. This can use my same separate heater, bias, current limiting, anode metering, high voltage, and water cooling setup. Efficiency at this frequency for the 7289 tubes can be expected to be only in the order of 25%. Mode problems as previously solved on 23cm may not be the same. But with an expected 500W out, SSB contacts off the moon should be possible!



Tube cross-section (4 ½" across)
4 tube 13cm ampl
one tube shown

10 W solid state amplifier

I purchased a Japanese 10W solid state linear amplifier (Millicom) with 28db gain to make my 10 mW sweep generator high powered for testing and driver use. This is the best power and gain commercial device available at this price, $400 and wire transfer. I have yet to use it though.

I will report on the progress of the project in the future and hope to have a working model ready for the Hamvention. You may contact me at Tel. (740) 636-9023

Fax (740) 495-1122
or e-mail NHEWA9OUU@ameritech.net

Q & A

This is a new feature we are introducing. Anybody can submit a question and we we will assign it a number and publish it in the newsletter. Of course, we expect with all the talent out there somebody will come up with an answer, which will then also be published. Following a few questions:

Q-1. Dynamic Range of the Eye. The range of the faintest just visible star has an astronomical magnitude of +6. This compares to the magnitude of –27 for the sun. So here we have a range of 33 magnitudes. The astronomical magnitude is defined: 5 magnitudes represent a factor of 100. Therefore the range from +6 to –27 is: 100 E 33/5 = 1.58 e 13 this converts into 132 dB. Now, of course, one cannot look into the sun and has to use some attenuation (filter) to present the eye with the maximum safest level. There is a lot of advice in the literature, but one cannot find exact numbers. One reference recommends to expose film completely (to get it as black as it could get), then use two pieces sandwiched between glass as a filter. Some exact numbers are needed. (WB8IFM)

Q-2. LNA? How does a LNA improve reception? What is the difference in mounting it at the antenna versus having it in the shack at the rx? Is it worth having and investing in the sequencers etc? (W8ULC)

Q-3. IR Motion Detector. I have recently installed two (different brand, but cheap) IR based motion detectors, which turn on lights. One is outside and works most of the time satisfactorily. Sometimes though, like in high wind, it will come on for no good reason. The photocell, that turns it off at night, works fine!
The other one is installed inside the garage and replaces a defunct thermo delay switch for the light. This one has two controls for sensitivity and on-time. I have the sensitivity all the way up and yet often, especially when cold, the light doesn't come on, both when somebody steps in the beam or when the car comes rolling in.
How do these things work? Are there better solutions, short of using the supermarket microwave detectors, which are pricey? (WB8IFM)

Solar Cycle Prediction