



Vol. 13 No. 8

www.ceitron.com/mvus/mvus.html

October 1999

October Meeting: Friday, the **22nd**, at 7:30 PM at the Perkins Restaurant at SR 73 and I-75.
Possible Talk by Jack, AA8Q about 2m Power Amplifiers

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Upcoming Events

EME-Contest Weekends: Oct. 30/31 and Nov. 27/28

Microwave Update at Plano TX Oct. 21-23

Registration: Al Ward, W5LUA 2306 Forest Grove Est. Rd. Allen Tx 75002 Tel 972-562-6018

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

De N8ZM

The turnout at the September meeting was very nice because we saw some old friends whom I don't remember seeing at MVUS in the past, as well as some totally new faces. I hope that all of them enjoyed the evening and the opportunity to share experiences with others interested in VHF and up.

Speaking of enjoyment, congratulations to the worldwide AMSAT group who have labored so long to build P3D, as they now have been able to announce a launch agreement with ESA, although the date is still not settled. (Hey, Keith, not only is mosquito repellent easier to pack than a parka, you'll only have to set your watch ahead by one hour). MVUS is well represented on the P3D project in terms of actual work being done by folks like WB8IFM, N8EHA, and KB1SF, but I hope it is also well represented in terms of monetary contributions from the rest of us. This has not been an inexpensive undertaking, like the earlier birds, and the expenses continue right up to launch time. Even if you don't plan to operate on this new satellite, consider a contribution to the cause as your way of helping to keep ham radio a fun and interesting hobby well into the 21st century. If having this bird in orbit helps just one youngster to become interested in ham radio and technology, you will deserve part of the credit. See how easy it can be to do good deeds and have a positive influence on the future!

Speaking of the 21st century, N.E.W.S. is sponsoring a Millennial Cumulative Microwave Contest, which will last throughout all of the year 2000. Contacts above 900 MHz are eligible, and a trophy will be awarded. Scoring is in part based on the actual distance between stations, and there are incentives for exchanging 6-digit grid square designators. I saw the notice in the NTMS newsletter, so I expect that it is being publicized in the usual places frequented by the microwave crowd.

By the way, Microwave Update is this coming weekend in Plano, TX. Dallas is only 2-1/2 hours by air from Dayton, so one could buzz down there easily. (OK, it ain't cheap, but the return on investment is much better than even the stock market can offer).

I'm hoping to have a talk on a high power home-brewed solid state 2m amp for the meeting, but the speaker is reported to be under the weather a bit, and I don't know the prognosis at this time.

Also, we'll be looking at the calendar for November and December to work out our meeting dates.

See you there, Tom, N8ZM.

This and That 10-99

- **Coffee Can Excitement.** John, WA9OUU, is getting ready to do some serious work on 2.3 GHz like EME. The other day he checked out his equipment. Bypassing the relay problem, he used separate coffee can type antennas for transmit and receive. Each antenna was made of two one pound coffee cans. After placing those on a picnic table, he called KE8FB in Columbus, OH, some 30 miles away for a test. Using just one watt at his end the connection worked out just fine. John has also been at work with the bias circuits of his "Octopus" (the 8-tube amplifier) and found a much simpler way of getting a stable bias, applicable for any tube amplifier. We hope to have a write-up etc next month. [Gerd, WB8IFM]
- **AMSAT Symposium.** The AMSAT Symposium in San Diego in early October was a great success. There were 230 registrations. For starters, Keith Baker, KB1SF, AMSAT-NA President, announced that a contract to launch the P3d satellite on an Ariane 5 had been signed. No firm date is known at this time. Next year's Symposium will be held at the end of October (to take advantage of the cheaper "off-season" rates) at Portland, Main. [KB1SF]
- **Computers:** When something is wrong with a computer most of us look for an answer. But computers are not as reliable as the sun and the moon or even the guy who sprays your home for bugs. [Bill Husted, KQ4YA]
- **Progress of Civilisation.** Why did civilisation get its biggest boost from Europe? A combination of observations with numbers, measurements and calculations seems to be the cause. Mathematics is a wonderful tool to organize, clarify and explain observations. Often measurements exist that can be described nicely by mathematics like Quantum Physics or a theory is announced followed by observations that confirm it as the Theory of Relativity.
- **Six Billion People.** That's a lot of people we have now on earth. (10^9 =American billion), but using mathematics and making some assumptions about the weight and size of an "average" person we can figure out e.g. the volume of that humanity if densely packed. It turns out that a cube with a side of slightly less than half a mile would suffice.
- **Lucky (?) Three.** Only one person in two billion will live to be 116 years or older; where and who are these three people?
- **Satellite Telephone.** Another highlight of the AMSAT Symposium was a trip to Qualcomm. There three portable phones were available and could freely be used to make calls to anywhere in the world. The calls were routed (wireless) to a small base station that made the connection to a LEO satellite. As satellite "handies", of course, they have to be used in the clear and first a check is made whether a cellular sight is useable. [KB1SF]
- **Proprietary.** Microsoft claims it can suck anything it wants into the operating system--broadening the definition of "proprietary" to the point where you might just throw it, well, right out the *Windows*.
- **Digital Subscriber Line.** Coming (soon) to your house, DSL allows Internet access at data transfer rates of between one and eight Megabits per second over plain old telephone service (POTS) lines. This is the "*killer application*" propelling a rapidly growing DSL market. [Michael E. Tzannes]
- **Harmful Audio.** Hundred watts for an audio amplifier is the norm nowadays. So you will find in the instructions a big "Listening caution" and the advice: "We recommend that you avoid prolonged exposure to excessive noise." And the following note for listening with headphones: "Avoid listening for prolonged periods of time to prevent hearing damage." Noticed the term "noise". I can hardly wait to see a note in a tv set pamphlet: "Do not watch for prolonged periods to avoid damage to your brain!"

One Step Closer to Launch

By Gerd, WB8IFM

With the signing of a contract between Amsat-DL and Arianespace, the commercial arm of the European Space Agency, ESA, we are one step closer to the long expected launch of the Phase 3d satellite. The contract calls for P3d to be a secondary payload on the first suitable Ariane 5 flight, which could be as early as April of next year.

Many of us have waited for years for P3d to get "up there" and it now looks like the first year of the new millenium will bring this dream come through. However, Karl Meinzer, DJ4ZC, the project leader comments: "While the launch of Phase 3-D could come as early as the first half of the year 2000, we must remember that Ariane's launch manifests are continually being updated to accommodate market changes as well as the availability of other payloads. Thus, one or more changes to P3-D's anticipated launch date, along with its specific Ariane 5 mission number, are a very real possibility before our satellite actually flies."

At the present time the satellite is back at the Orlando lab, after having gone through the mandatory shake and vibration testing. It is being checked out one more time and some problems are getting fixed. By November it should be ready for crating and for an airlift to Kourou in French Guiana in South America.

After that the lab at Orlando, best known as the "P3d-Lab" will have to be closed, which is too bad, however, it is the only choice for the cash starved AMSAT organisation. This lab, for a number of years, has been an excellent facility to put P3d together and several other related projects. It has been the meeting place for many foreign hams, who built their "babies" (receivers, transmitters etc) and the deliverd them to the lab, to be integrated into the "big Bird". They participated in checking out the equipment and tweeking it to top performance. Many local hams also contributed hundreds of volunteer hours to the project and a handful of "out of towners" spent time at the lab, as I did. It's been extremely educational and satisfying. It would be nice to keep the lab going and provide for many young people a place with "hands-on" experience in building projects for space applications. A number of universities, spurned by grants from NASA, are now starting space related courses and would love to have such a facility for practicing students.

In the meantime, we certainly have a small but dedicated number of hams, capable of building space hardware. It would be nice if more hams would get involved

Pictures from the signing of the P3-D launch contract are on the AMSAT-DL website: www.amsat-dl.org
The Arianespace launch schedule can be found at: www.arianespace.com/english/news_status.html#10

The picture below is by Wilfried Gladisch from the celebration (toasting) after the contract was signed
Left to right: C. Bardou und B.Eilertson (Arianespace), K. Meinzer, DJ4ZC und P. Gülzow, DB2OS (AMSAT-DL).

Audio DSP for Contest

Gerd Schrick, WB8IFM

DSP has been around for a while and for hams it's mostly being used to strip noise from weak signals. Therefore it is ideally suited for pulling out weak signals, when in a contest all the strong stations have been worked.

There are many units on the market and just about all will perform as advertised. The price range is in the order of a couple of hundred dollars. At one time Radio Shack was offering a unit for less than \$100.- and I thought it was too good to be true, and it was! It was clearly mislabeled and was just audio filtering the passband.

In general and in particular for contests you want a unit that performs with a minimum of fiddling and when you apply this criterion, then immediately a number of units fall by the wayside. I don't know when and how it started, but manufacturers seem to assume, hams actually enjoy fiddling with knobs. Except they failed to recognize that even a dimwitted ham will sooner or later realize the 20 knobs to just tune or adjust the frequency is too much. So many controls on equipment are totally unnecessary, but on the other hand important functions may be missing or are shortchanged. Enough said.

By trial and error we found the Timewave DSP 9+ best suited for our purpose. Once you splice it in between your audio output and your head phones, there is almost nothing else to do. It has a few positions to select from and all make perfect sense. Once selected, the unit can even stay in for the strong signals. Another nice feature is, it uses an 1/8" stereo jack: this is an industry standard and now you can use those inexpensive (a few \$ on fleamarkets) headsets directly w/o soldering a new plug. We use a y-adaptor for two headsets and two operators.

With the DSP function turned on a clear improvement is audible, as initially mentioned it brings out the weak signals and releases the strain on your ears.

We were using the DSP 9+ for fieldday and were worried about the one ampere current as stated in the manual, however, the unit does only draw 300 mA. Still a bunch when you compare this to a full fledged analog RF type speech processor (Datong) which pulls a miserly 20 mA.

NE8I/Rover Cumulative 10 GHz+ Score

| | 10 G | 24 G | 47 G |
|---------------------|------|------|------|
| No. of QSOs | 16 | 5 | 4 |
| Total Distance (km) | 1945 | 201 | 4 |
| Best Distance (km) | 265 | 180 | 1 |
| Unique Calls | 6 | 4 | 3 |
| Per Band Score | 2545 | 601 | 304 |

And Sept. UHF Rover Summary:

135 QSOs, 230 Points, 55 Grids (10 grids activated) **15,470** Claimed Score

Sunday was great! On from 6m to 47 G! Equipment Break-Downs: Lots!!! Best Distance across Lake Erie!

ARRL TASK FORCE SEEKS FUTURE TECHNOLOGY PROPOSALS

ARRL Bulletin 61, Newington CT Sept.9, 1999

The ARRL Technology Task Force wants to hear from hams with ideas and proposals for new technology to carry Amateur Radio into the next century. The ARRL Board of Directors created the Task Force and the companion Technology Working Group last January, and ARRL President Rod Stafford, W6ROD, has appointed a number of leading amateurs to serve on both panels. The Task Force and the Working Group will work hand-in-hand to identify, evaluate, and promote the most promising 21st Century technologies for Amateur Radio.

The Task Force consists of members of the ARRL Board family and the Headquarters staff. Chairing the Task Force is ARRL First Vice President Steve Mendelsohn, W2ML. Other TTF members are Roanoke Vice Director Dennis Bodson, W4PWF; Hudson Director Frank Fallon, N2FF; New England Director Tom Frenaye, K1KI; Southwestern Vice Director Art Goddard, W6XD; Pacific Director-elect (and current Vice Director) Jim Maxwell, W6CF; International Affairs Vice President Larry Price, W4RA; and Rocky Mountain Director Walt Stinson, W0CP.

The Technology Working Group will evaluate technical proposals and make recommendations to the Technology Task Force, which, in turn, will make specific policy proposals to the ARRL Board of Directors.

The Working group is an expert panel selected from among League members representing a broad spectrum of Amateur Radio interests and activities. Chairing the Working Group is CQ Editor Rich Moseson, W2VU. Other members are AMSAT-NA President Keith Baker, KB1SF; Peter Coffee, AC6EN; Mike Cook, AF9Y; Gene McGahey, NR0NR; ARRL Technical Relations Manager Paul Rinaldo, W4RI; Dennis Silage, K3DS, and QEX Editor Doug Smith, KF6DX.

ARRL Laboratory Supervisor Ed Hare, W1RFI, will serve as ARRL HQ staff liaison to both committees.

The Task Force invites information and concepts on a wide range of technologies with the potential to improve Amateur Radio and to promote what the FCC calls "continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art." The Task Force invites the submission of ideas and proposals from all parts of the amateur community, and will use the input to help formulate League policy recommendations on a wide range of technical issues.

Amateurs are invited to complete the form on ARRLWeb at <http://www.arrl.org/news/ttf/>, send e-mail to the Task Force at ttfinput@arrl.org, or offer your ideas by mail to the ARRL Technology Task Force, c/o Ed Hare, W1RFI, 225 Main St, Newington, CT 06111. Suggestions are requested by November 30, 1999.

FCC RELAXES RULES FOR SPREAD SPECTRUM ARRL Bulletin 62

The FCC has relaxed rules governing the use of spread spectrum techniques by radio amateurs and opened the door to the possibility of international spread spectrum communication. The Report and Order in WT Docket 97-12 adopted August 31 concludes a proceeding that originated with an ARRL petition in December 1995 and has been pending since 1997.

The FCC adopted rules that will allow Amateur Radio stations to transmit additional spread spectrum emission types. Once the new rules become effective November 1, hams will be able to use techniques other than frequency hopping and direct sequence spreading. In addition, the new FCC rules will permit US hams to use spread spectrum techniques to communicate with amateurs in other countries that permit SS. Spread spectrum communication has been limited to stations within FCC jurisdiction.

The new rules require that spread spectrum stations running more than 1 W incorporate automatic transmitter power control. Amateur stations using SS are restricted to a maximum power of 100 W.

The Commission also amended the rules to eliminate what it called "now-unnecessary record keeping and station identification requirements" that apply only to stations using spread spectrum.

The FCC agreed to let SS stations identify themselves using conventions developed by the Amateur Radio community.

Roanoke Division Vice Director Dennis Bodson, W4PWF, who has followed the League's Spread Spectrum initiative through from start to finish was pleased with the outcome of the proceeding. "I'm very happy," he said. "The League got everything it wanted and more--all of which, I believe, will help to promote this mode on the amateur bands."

Stations employing spread spectrum techniques will remain secondary to--and must accept all interference from--stations employing other authorized modes. The FCC declined to authorize the use of spread spectrum techniques on additional bands or frequencies.

A copy of the FCC's complete Report and Order is available at <http://www.arrl.org/announce/regulatory/wt97-12>.

Lightning can ruin your day.

By Gerd, WB8IFM

There is not much you can do against a direct lightning hit. Even completely “unplugged” equipment might be affected. Look at it as a powerful RF signal that momentarily creates an extremely strong field and thus gets into everything that is close. Size of the “metallic” equipment and its attached wires determine the amount of energy that is picked up ... you take it from there ...

Literally, “in a flash”, lightning can do a lot of damage. Today's solid state equipment is more than ever susceptible to damage by lightning induced over voltages and, since the trend is to lower operating voltages, this situation is not getting any better.

I got hit in late May during a nighttime thunderstorm. Of course, all the equipment was turned off and the antenna switch set to dummy load. Half asleep, I saw the flashes and routinely counted the seconds until I heard the thunder. I noticed it was very close but didn't give it much attention.

Next morning (Sat 22 May) after breakfast I turned on the computer to do my daily e-mail but I couldn't get it to work. After some experimenting, unplugging this and that, I found that indeed the modem was defective. Well, I heard people had often trouble with their PC and/or modems through voltage spikes, and the industry makes a lot of money selling “surge protection” outlet strips to run your equipment. Since the PC was working fine and it was fed with “raw” unprotected AC, I thought the spike must have come in over the phone line. So I checked all the rest of the equipment connected to the phone line: Fax, answering machine and the various other phones; all checked out working fine. Lucky me, I thought.

There was a computer show that day which we attended, and a new modem was now number one on my list. Getting back home the new (external) modem was connected and I was back on the internet. All seemed ok again.

Later in the afternoon I turned on the FM stereo to listen to some music, but the set remained silent, cranking up the gain, changing the station did no good, playing a CD, however, was ok. So, obviously the frontend was gone. Now I got suspicious, I grabbed the remote and clicked on the TV, nothing happened, the same with the VCR, the outlets checked out ok and the antenna rotator worked. Now I really got perturbed and the next stop was at my ham shack.

Throwing the main switch, which is a knife switch separating the two 120 V phases from the outlets of 120 and 240 V in my shack, my TR-7 came on right away but it was dead silent on receive and there was zero output on transmit. Moreover, I sensed the smell of burnt insulation. The other piece of expensive gear, the dual band Yaesu 736 satellite receiver was also completely dead and a quick check of the fuses gave no clue.

That was the situation, when I left for a month of work on the Phase 3d satellite at the Orlando lab. While there, I got an e-mail from the xyl telling me there was an eyewitness to the lightning: our neighbor to the West, who is gravely ill and can't sleep too well, observed the whole thing. She described the entire house being engulfed in sparkles. Also the same storm hit an apartment complex about 2 miles away which burnt down with a damage of \$400,000. Nobody got hurt.

After I got back there was time to further evaluate the damage and I found a few lesser items that were affected also. Although the rotor control box still indicated the position of the antenna the lever that moves it left and right, wiggled freely when I touched it but nothing happened. A bunch of contacts were all burned up and the little steel spring was even severed. Looking at this switch, the whole construction and studying the schematic I was tempted to junk this thing and “roll” my own. This was truly a design that had survived generations after the motto: “if it ain't broke, don't fix it”. I even found a selenium rectifier in it. And, by the way, the smell I noticed earlier came from burned Bakelite, a material from way back when. Next I found that the SWR/power meter did not work. This one in a small box had a burn mark on the bottom with a 1/8” deep crater.

This sure was a strange hit we took. It had very little to show on the outside. Careful inspection revealed a number of burn marks around screws that held down outlets. It seemed like a sneaky killer had crept into the equipment and selectively ruined sensitive essential parts. Some of the pieces are not worth worrying about and are better replaced with new gear, but I will check out and look into the TR-7 and the 736 to learn what happened and get it fixed.

What could be done better to prevent such catastrophe in the future? While in Florida, admittedly a thunderstorm eldorado, I had a chance to meet Dick Jantzen. WD4FAB and see how he deals with this problem. Dick had lived at his place in Maitland, just north of Orlando, for many years and survived numerous lightnings w/o getting any damage. What is his secret?

Dick separates all the station's connections to the outside physically at least by a foot or so. This includes all the antenna, rotor and other control cables as well as the AC mains using a cord and plug at the station's end. Furthermore the station “floats” meaning there is no lead to a common outside ground. The idea is to have lightning “bypass” your equipment, creating an effect like a Faraday cage.

Depending on your station's layout, this set up might not be too hard to implement. In any case it would provide that peace of mind which I am presently lacking when I hear distant thunder.

Report from the Pac Rats Conference Oct.2
By Lloyd Ellsworth, NE8I, POB 2132, Dearborn, MI 48123-2132

Beautiful Weather. Great Conference.

***1St 75GHz VUCC.** WA1ZMS talked about his station, what it took to make it work and happen.

***Microwave activity from FM17 (including 24GHz).** N4MW talked about the microwave activity in his area, details of the grid square, and showed off and explained his HB 24G station, and HB 100mW beacon for 24GHz. During lunch, I got out my 24G station, and we demonstrated 24GHz narrowband.

***Line of sight plot server.** KB 1VC has a web sight, with quite a program to plot out LOS paths. Free of charge on the internet. These look really good. Explained how it worked, and gave some examples.

***The 60' Kennedy dish project.** KB2AH and K2UYH have gained access to a 60ft Kennedy dish at Camp Evans in New Jersey. No longer a military base. Dish surface is good to 6 GHz. This dish has been placed on a US Government Historical site, so it will be accessible to us amateurs for some time. They are looking for help, volunteers and funds to fix it up. and get it on the moon. Also for SETI etc.

***VHF Amplifier Design.** WA4GPM talked about tube amplifiers. He worked at Eimac for a while some years back. His talk was centered about a 4CX1500B amplifier for 6 meters

***A DDC-Based Receiver.** KC1HR talked about advances in digital receive circuits and his experiments. Gave a bit of the history and glimpse into the possible future of our receivers, and the technology that make them work.

***432 EME** station of NC1I. 48 yagi's. Adjustable az/el and polarization array. Big. gave quite a talk about it. What it took to design, build and install it. The headaches, and solutions.

***Limited Multi-OP contest operation of NC1I** and NIDPM. They talked about their hilltop contest site in Mass. What it took to make it happen. Many great ideas.

***1W 24GHz Amp.** W2PED talked about his design of a 1W 24GHz power amplifier. This is a joint project between Pac Rats and Microwave Update. Shows that if we work together, we can really produce something worthwhile to be proud of and very useful. With our combined efforts, talent, and resources, provide something (24G power) that is otherwise simply not available. If it works out, many more projects might happen in the future. We, as amateur radio, still prove that we are state of the art.

***ND3F Rover Operation.** ND3F talked about his rover station and experiences. He had it set up in the parking lot. Gave tours. He started his talk by mentioning he learned useful things for his rover operations from each of the previous speakers. In every talk, there was something useful for all of us.

The **dinner** was great. Excellent company, talks, and yes, prizes. Thanks to all the donors. Quite an impressive wall of prizes. Many East coast ops mentioned that they are seeing more 222 and 903 activity. A good sign.

One of the ideas suggested, and talked about was using 222.120 +/- for use as a link and feedback for microwave operations. This rather than 144 or 432. Reason. It seems that for multi band stations, 222 is the one band that can stand alone (28 MHz IF) and be used at the same time as their 144 is being used as an IF. Causes less interference than 144 Mhz. Around EN 82, we have been using 144 not just as a link, but so that SWL's can easily hear what we are doing on the microwaves. Encourages activity. However, 144 does cause interference with the IF.

The Pac Rats have a new home for the Hamarama flea market: the Middletown Grange in Wrightstown. Real nice inside and outside spaces. Plenty of good parking. Good weather. Found lots of goodies. The former location, a drive-in-theater, is now a Target store.

Next year. the Pac Rats are sponsoring **Microwave Update 2000**. Sept 28 to Oct 1, 2000. A 4 Day event. Thursday: surplus tour. Friday and Saturday: the Conference, and Sunday the Hamarama Flea market. It will be held at the Bucks County Holiday Inn Select. (215) 364-2000 or (800)HOLIDAY. Make reservations early.

Really looking forward to next year. 73, Lloyd, NE8I.

PS. Lloyd made a **Video** of the Conference Presentations and he made a tape available for the club members, We will have the tape at the meetings. Anybody, for the cost of shipping, can borrow it. About the tape Lloyd comments: "I make these tapes as a record of where we are, and to encourage and promote amateur radio activity. Not for any commercial use or distribution. I do not use a tripod. This causes the tape to be difficult to be watch. Not professional at all. Many other production and recording errors. The way I view it is this. If you really want to watch it, you will. If you want to enjoy the conference programs without all the garden hose and other problems, then, next year, you will somehow manage to attend the conference. Be encouraged to attend. I also suggest to any viewers, to support in some way, the groups that make these conferences possible, the speakers, and when using anything learned or borrowed from them, to make certain to credit the source." In the case of this years Pac Rat Conference, no proceedings were produced. So, then this is a limited and unique record.

Microwave Update "99" Scheduled Papers/Activities Harvey Hotel, Plano, Tx Oct. 21/24

- * LO Phase Noise Management in Amateur Systems by Rick Campbell, KK7B
- * RF Network Analyzer Basics by Wes Atchison, WA5TKU
- * Rover for 5.7 GHz and LNA Update by Tommy Henderson, WD5AGO
- * Computer Designed VLNA by Les (Lucky) Whitaker, W7CNK
- * Amateur Communications using LASERs by Lilburn Smith, W5KQJ
- * Noise Figure / Spectrum Analyzer / Network Analyzer / Phase Noise Test Equipment Workshop
Conducted by W5LUA, WA8WZG, WD5AGO, W5ZN, W7CNK & WW2R
- * Further Evaluation of the W5LUA and W5ZN Dual-Band Feedhoms by Joel Harrison, W5ZN
- * 1Watt Power Amplifier for 24 GHz by Paul Drexler, W2PED and John Sortor, KB3XG
- * Multi-Band Feeds for Parabolic Antennas by John Anderson, WD4MUO
- * A Unique System for 120 and 145 GHz and An Update On Millimeter Surplus by Will Jensby, WOEOM
- * Russian Tube Cavity Amplifiers for 23 and 13 cm by Barry Malowanchuk, VE4MA
- * Cavity Amplifier Construction by Ed Krome, K9EK * Converter use by Chuck Houghton, WB6IGP
- * Slide/Video/Poster Show WA8WZG - Microwave Operators in the Midwest – Part 2
- * 350 W TWTA for 3cm by JR1EDE * A SYNPLEXER Rig for 13 cm by Ed Munn, W6OYJ
- * The Qualcomm Synthesizer, easy LO for microwave, San Diego Microwave Group
- * The Latest Qualcomm 10 GHz Transverter Project by Kerry Banke, N6IZW * Loop Yagis by Mike Walters, G3JVL
- * Equipment for Accurate Microwave Frequency Setting by Dave Robinson, WW2R
- * Rain Scatter at SHF and EHF by Tom Williams, WA1MBA * Rain Scatter - European Style by Sam Jewell, G4DDK
- * Tips for Constructing a Microwave EME Station by Jeffrey Pawlan, WA8KBL
- * Understanding Circular Waveguide – Experimentally by Paul Wade, WI GHZ
- * Single Board Transverter for 10 GHz by Paul Wade, WI GHZ and Steve Kostro, N2CEI
- * World's First 75 GHz VUCC by Brian Justin, WA1ZMS/4 * 47GHz in the UK/Europe by Lehane Kellett, G8KMH
- * TWT Applications by Greg McIntire, AA5C * AMSAT Update by Keith Pugh, W5IU
- * Antenna Feedhom Measurement (902 MHz through 24 GHz) conducted by Joel Harrison, W5ZN in Hotel Parking Lot
- * Antenna Gain Measurement (902 MHz through 47 GHz) conducted by Kent Britain, WA5VJB in Hotel Parking Lot