

MT. AIRY V.H.F. RADIO CLUB, INC.

CHEESE BITS



W3CCX
CLUB MEMORIAL CALL

ARRL
Affiliated
Club



Volume XLIV

2002

Number

Prez Sez

The contest is behind us. I want to congratulate all of you that participated on a job well done. I always find ways that I could have done better or looking thru the log I find that I failed to work someone on a band I know they have. Well there is always the next contest. Now is the time to make a list of what you want to improve in your station, don't wait till next contest by that time it will be too late. Building my station is an ongoing process that has no end. The next projects here are to package up my 903 system, install new antennas for new bands, change the transverter switching system for more isolation, and on and on.

I want to thank Ben WA3RLT for a very interesting talk at the last meeting and his analysis of our efforts of last January contest. Looking at the graphs showing that if you hang in to the end you won't be disappointed in your score. I am also grateful to Paul WA3GFZ for taking the volunteer position of Awards Chairperson. We are hoping to have some variations of the awards categories this year. We are especially proud to now have four awards sponsors, including W0RSJ, C3i, K1JT and K1DS. A few more award sponsor s would really round out the picture. Please volunteer your financial support for the recognition of the efforts made by club members for the January VHF SS. Call or email to me.

It was good to see rover activity in the contest. Rick and Leon weathered the storm very well. It was cool to have my laser working, a new band!

Our "Crying Towel" meeting is coming up I hope you all take a minute to put together a story of woe or just say something about your contest weekend experience. It has been expressed in the past "that each contest has its own personality" and I think this is true. What personality did you see? Get on the radio and keep listening for the weak ones.

73, Brian N3EXA

2002 VHF SS Contest Wrap-Up 10AM

**Saturday, February 9th at QTH of Bob Fischer, W2SJ, Pennsauken, NJ.
Coffee and Donuts for Early Birds. Lunch Available. See inside for details**

February Board of Directors Meeting

Thursday, February 14th, 8PM

At QTH of Paul Sokoloff, WA3GFZ. All members invited. See inside for details

Monthly Meeting

Thursday, February 21st, 8PM

"The Cryin' Towel"

Southampton Free Library, 947 E. Street Road

Bring your stories, pictures and props. Invite a guest to come with you!

Pack Rats **CHEESE BITS** is a monthly publication of the
Mt. AIRY VHF RADIO CLUB, INC. -Southampton, PA.

SUBSCRIPTION RATE: \$16.00 PER YEAR (USA)
\$20.00 PER YEAR (CANADA)
\$10 PDF only \$24.00 PER YEAR (ELSEWHERE)

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222.98/224.58 MHz, Churchville, PA

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Awards Chairman WA3GFZ 215-884-3116

PACKRAT BEACONS - W3CCX/B

FM29jw Philadelphia, PA
50.080 144.284 222.065 432.295 903.071 1296.251 MHz
2304.037 3456.220 5763.190 10,368.140 MHz (as of 3/1/01, but currently weak)

MONDAY NIGHT NETS

TIME	FREQUENCY	NET CONTROL
7:30 PM	50.150 MHz	WA3EHD/K3EOD
8:00 PM	144.150 MHz	N3ITT
8:30 PM	222.125 MHz	W2SJ/N3EXA
8:30 PM	224.58R MHz	W3GXB
9:00 PM	432.110 MHz	W3RJW
9:30 PM	1296.100 MHz	WA3NUF
10:00 PM	903.100 MHz	N3AOG

THURSDAY NIGHT NETS (1st & 4th of the month)



A well engineered and neat operating shack for Phil, WA3NUF

Editor's Column

Part of this column is being written a week before the Jan VHF SS, and I'm pretty much set to go, thanks to lots of helpful suggestions and testing from the gang. K2TXB did the tower work for the 10G dish for W2SJ, with the help of AA2UK also, and there was a lot of email and repeater exchanges supporting testing, loaners, fixes and just emotional support to those whose equipment was less than cooperative. Now we're hoping the weather holds. W3RJW and WA3NUF were on the air regularly helping others, while W3KM was busily loading programs into computers and his website. Many club members took advantage of the "Microwave Days"—first Sat AM and first Monday PM of January to test their gear. I learned a few things and got them fixed then too—like my rotors (thanks to Norm's Rotor Service) and the balun for the 432 antenna.

The most amazing postings can take place on the microwave reflector. When one guy asked for some thoughts on measuring model rocket speeds with an X-band radar gun, a whole bunch of engineers, physicists and mathematicians jumped right in, with quoted references, experiences, ideas and comments. It certainly was mind-enlarging. For my two cents, as an Estes Rocket Modeler in the 60's, it was a stepping stone for lots of adolescents to get into the sciences, math and engineering fields. I'd certainly encourage any of those activities that stimulate our youth to do construction activities and gauge their success with use of the projects and competitions, much like we do in our contesting.

The call for sponsors for our Packrats contest winners has yielded four respondents to date: Bill, W0RSJ; C3i thanks to Owen, K6LEW.; Joe, K1JT and myself, K1DS. We hope that others will join this group and add their donation and support for the Packrat Award Program. Paul, WA3GFZ has graciously volunteered to be the Awards Chairman, and was charged by the Board of Directors with initiating some new and different award categories that will recognize growth in capability and results, in addition to "Top Gun" status. Your support and feedback is useful to the success of the award program. Let us know if you will be a sponsor (suggested amounts \$25-\$75) or have a suggestion for Paul on the awards categories and metrics.

Well, it's now a week after the contest, what a unique set of conditions for our geography...a snowstorm coinciding with the first 12-14 hours of operation, followed by a bright and sunny cold day, and as I understand, plenty of 6 meter opening—double-hop to the West Coast on Sunday. Unfortunately, for the two of us in the "Great White" rover van, we didn't work more than a handful of 6 meter grids, using only 160 watts and a dipole—and spending more time concentrating on the microwave bands and giving out the points, rather than trying to rack up the multipliers....but if we did, we'd have a score of...maybe next year!

I'm all set for the Cryin' Towel meeting in a few weeks—preparing our story and a few props. I haven't seen or heard much from the gang, but it was clear from travels in the rover that there was a real lot of action going on for everyone, and especially for those with new microwave bands added.

Congratulations to the newest Packrat, Mike Sabal, KB3GJT. It's great to see continued membership growth. Make sure you all get to introduce yourself to Mike at an upcoming club event. Once again, my thanks to Harry, W3IIT for all his useful contribution to this issue. 73, Rick, K1DS

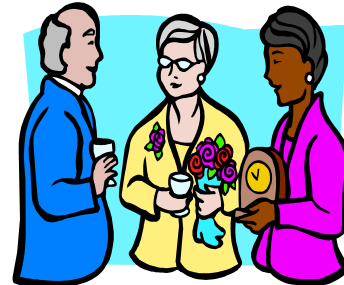
Correspondence

I was sorry to have missed the contest but because my brother was in the hospital, I had to miss the contest. He's doing much better now. It was the first contest I've missed since January of 1969 when I entered my first one as WA4PNH in Daytona Florida before moving up to Rat Land that spring. Hope the club had enough entries for the unlimited class. I did not have a rig with me in Indiana but it would have been too far away to count for the club. **73, Harry, W3IIT/4 EL98QE** until mid April

Lots of interesting discussion going on here. Why not get on the air? We have to get off our keyboards and in some cases like mine go to a remote shack and operate. I find talking to new hams on 6 and 2 meters a far better way to cultivate interest than QST or any ham publication or reflector. While most were getting a good night's sleep before the Perseid's meteor shower I went out to check out my equipment. I got on the air called CQ and guess what the 2 meter band was open from Southern New Jersey to Chicago and Ohio and Michigan. Just only a few stations on to work. But I found KB8Q in EN71 and worked him easily through 903 from FM29. When I returned to 2 meters looking for others some of the local newbies heard me move KB8Q up and were interested and in shock when I told them I worked him through 903. Now that in my opinion is stimulating the hobby. I applaud all efforts to promote the hobby, be it written information, conferences, QST or reflectors but there is no substitute for operating. WA1MBA and others in New England surely remember the first time we've worked with almost meter pinning signals through 10 ghz during summer tropo ducts. For me the thrill of operating is still there. Others might want to try it, it works to promote the hobby. **Bill AA2UK**

Congrats to N3NGE who won division in August UHF contest, SO HP, and other Rats (W3KM, W2SJ, K1DS) and friends who made a great effort and sent in the log. See new QST. Unfortunately, I didn't; I only spent a 1/2 hr on. Should have sent in anyway. Good going Len! **73 Joe - AA3GN**

WANTED



PARTY MAVEN!

**TO ORGANIZE A PACKRATS
SOCIAL EVENING EVENT
CANDIDATE MUST KNOW HOW TO
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AND THROW A PARTY
CONTACT BRIAN N3EXA
215 257 6303 or 215 783 3040**

Radio Action February 2002

SUN	MON	TUE	WED	THU	FRI	SAT
	Mondays are Net Nights. See P2 for times and freqs and net control starting 7:30pm				1	2 Microwave Activity 8am-1pm-432 & up
3	4 Microwave Activity 7-11pm-432 & up Get on air and test ur gear!	5	6	Don't Forget next week is Valentine's Day	8	9 Contest Wrap-up at QTH of W2SJ see p8 for direx Coffee & Donuts for
10	11 Mondays are Net Nights. See P2 for times and freqs and net control starting 7:30pm	12	13	14 Board of Dir at QTH of WA3GFZ. See P9 for Direx Valentine's Day	15	early birds at 10am and lunch will also be served. Tours of the 3rd floor 10 gig shack will be con-
17	18 Mondays are Net Nights. See P2 for times and freqs and net control starting 7:30pm	19	20	21 Club Meeting "The Crying Towel" Prepare your comments for the group	22	ducted as needed!
24	25 Mondays are Net Nights. See P2 for times and freqs and net control starting 7:30pm	26	27	28	March Meeting is Homebrew Night Ready ur project	

K6LEW RECEIVER TEST PROCEDURES

A standard series of tests I use for VHF multimode radios is similar to tests done on HF radios. For receive, you'll want to determine the following: CW minimum discernible signal (MDS), FM 12 dB SINAD, CW blocking dynamic range (BDR), 20 kHz spacing (and any others you might want to add), FM adjacent channel selectivity, 20 kHz (and any other spacings) CW 2-tone, 3rd-order dynamic range, 20 kHz and any other spacings FM 2-tone, 3rd-order dynamic range, 20 kHz, 10 MHz and any other spacings CW 3rd-order intercept (using an S5 signal as a reference) I use a distortion analyzer (actually you can use a VOM with a DB scale almost as well) to measure audio output level changes and distortion levels. MDS is a 3 dB (signal+noise)/noise figure, i.e. you measure the audio output level with just noise and then use a signal generator to increase the output by 3 dB. The signal level at the receiver's antenna input is the MDS.

FM 12 dB SINAD is equally easy. Just set the generator to 3 kHz deviation with a 1 kHz modulating signal and adjust the level to produce a 25% distortion on the receiver's audio output. The signal level at the receiver's antenna input is the 12 dB SINAD. Note the equivalent dBm and microvolt figures for this measurement, as the microvolt figure will allow convenient comparison to other FM rigs and the dBm figure is necessary for the dynamic measurements. For BDR, use a step attenuator on the generator's output and use the relative magnitude function of the distortion analyzer (or other audio level measuring device). Determine the strongest signal you can put into the receiver without overloading it by locating the 1 dB compression point. To do this, I set the signal generator to a particular level, then decrease the step attenuator by 10 dB. If the audio output goes up 10 dB, you are within the linear range of the receiver, so increase the generator a few dB and try it again. When the audio output goes up by 9 dB, that is your 1 dB compression point. Once you have the compression point, connect 2 signal generators via a two-port coupler (also known as a hybrid combiner or even a regular power divider for our frequencies) to the receiver and set one generator on frequency with a level that appears as 10 dB less than the compression point at the receiver's antenna port. Set the other generator to the blocking frequency (I use 20 kHz on both sides of the desired signal for standard tests and add 50 kHz and 100 kHz for my "expanded" tests) and set it to a low level to start. Set the audio measurement device to -1 or -2 db relative. Slowly increase the level of the second signal generator. When the audio output changes by 1 dB (up or down), you have reached the blocking level. Note the level of the second generator's output and subtract the losses from the combiner and any attenuators you are using to determine the level at the receiver antenna input. The BDR is the difference between this level and the CW MDS. If the audio output increased, this would have been due to an increase in oscillator noise, so the measurement would be noise-limited in that case.

For FM adjacent channel selectivity, the idea is similar, but the audio measurement is distortion. The first generator is set to create a 12 dB SINAD (with combiner and attenuators inline) and the second generator is used (modulated at 400 Hz) to increase the distortion to 50%. The level of the second generator into the receiver's antenna input, subtracted from the 12 dB SINAD level, is the adjacent channel selectivity. While you have the FM adjacent channel selectivity set up, take an additional

measurement that you will use for the FM 2-tone, 3rd-order dynamic range (DR) test. Turn the modulation of the second generator off and readjust the level as necessary to bring the distortion back to 50%. Subtract the 2nd generator level (into the receiver, as usual) from the SINAD figure and record this as the phase noise limit in dB. For the 2-tone, 3rd-order DR measurements, I use step attenuators and set both generators to a fixed level that is high, but not high enough to cause IMD effects to occur within the generators (given the isolation of the hybrid combiner). I use a generator level of -17 dBm (since my combiner has 3 dB of loss, this makes off-the-top-of-the-head calculations more convenient). Set the generator frequencies to a distance of 1 times and 2 times the spacing from the receiver frequency (i.e., for 20 kHz DR at 146 MHz, use 146.02 and 146.04 MHz, respectively). For FM, turn the modulation off for the generator nearest the receiver frequency. Modulate the other generator with 1 kHz at 3 kHz deviation. Set the step attenuators to a high amount of attenuation to start (50-60 dB at least) and decrease them gradually until you see an MDS (for CW) or 12 dB SINAD (for FM) response on the audio measuring device. Record the level into the receiver as the level of one of the generators minus all attenuation of the test setup. The difference between this level and the MDS or SINAD response (as appropriate) is the 2-tone, 3rd-order dynamic range.

For CW, determine if the measurement is noise-limited by turning off the output of the generator furthest from the receiver. If the audio drops by a dB or less, the measurement is noise-limited. For FM, compare the result of this test with the phase noise limit recorded previously. If the phase noise limit is lower, then the phase noise limit is the actual FM DR and the measurement is noise-limited. For the CW 3rd-order intercept, use a single generator to induce an S5 response in the receiver (by the receiver's S-meter). Note the level into the receiver. Next, connect 2 generators via a combiner and attenuator and duplicate the CW 2-one, 3rd-order test, except this time adjust the attenuators to produce an S5 response in the receiver. Again, note the level into the receiver. Calculate the 3rd-order intercept using this formula: $IP3 = (3 * (S5 \text{ IMD level}) - (S5 \text{ reference})) / 2$

Good luck, **Owen, K6LEW**

10G Whitebox Notes

I have had a few requests for details of modifications to the 10GHz MaComm Base Station or hub Whiteboxes ... eg the ones with a 1 watt PA and RX preamp already built in. I have just put a downloadable PDF article (813KB) onto my archive website at:

www.microwaves.thersgb.net/BaseStat.pdf

Please feel free to use it, distribute it, put it in local newsletters etc ... if you think it is of any interest. I must emphasise that it was a one-off attempt to modify that particular box but it appeared to work all OK... trouble is, I never used it away from the test bench as I already had another system for general use.

A belated Happy New Year to all on the reflector.

Peter Day, **G3PHO**

Sixth Annual Southeastern VHF Society VHF Society Conference

On behalf of the Southeastern VHF Society, I would like to invite you to join us in Oak Ridge, Tennessee April 26-27, 2002 for the Sixth Annual Southeastern VHF Society Conference. Registration, program details, hotel and travel information can be found at <http://www.svhfs.org/>

The conference promises to be an interesting & exciting event with presentations from accomplished VHF+ amateur radio enthusiasts from several parts of the country. In addition, we will have antenna gain measurements, pre-amp gain and noise figure measurements, the Friday evening flea market with vendor displays (Down East Microwave is one vendor planning to come), the Saturday afternoon auction, and of course, the Saturday evening banquet, which is open to everyone. Drawings for the notoriously enviable door prizes will follow the banquet.

We are also putting out a call for papers. If you are interested in submitting a paper to be included in the Conference Proceedings, please get in touch with Skip KG4QDZ, kg4qdz@arrl.net. The deadline for submission is set at March 1, 2002.

73 & thank you for your time, Greg Robinson KB4NVD
Rover@wireco.net SVHFS Conference Publicity Chairperson

CQVHF Returns!

Well gentlemen, it's official. CQVHF is returning. Bolstered by popular demand CQVHF will be returning as a quarterly publication. First issue is scheduled to be introduced at Dayton.

Edited by Joe Lynch, N6CL, CQVHF will lean more to the technical side this time along the lines of Communications Quarterly. As popularity picks up, it will probably become a bimonthly publication. Monthly is going to need a lot of support in the form of articles and subscriptions. I'll again be writing a column, mainly on antennas at first. So if you have suggestions for topics, or better yet technical material, please get in touch with Joe N6CL@Fuller.EDU Deadline for the first issue is March 1st. 73's **WA5VJB** (from the web)

FCC REALLOCATION RETAINS AMATEUR RADIO'S 219-220 MHZ SLOT

Amateur Radio's secondary allocation at 219-220 MHz remains intact in the wake of an FCC spectrum reallocation of the 216 to 220-MHz band, among others. The FCC declined, however, to go along with ARRL's request to expand amateur access to 216 to 220 MHz. On a brighter note, the Commission potentially relieved spectrum competition for Amateur Radio at 2.3 GHz by making space available elsewhere.

The FCC acted December 21, 2001, in ET Docket 00-221 and in several other proceedings that it lumped into a single Report and Order and Memorandum Opinion and Order released January 2, 2002. The FCC Order reallocated 27 MHz of spectrum in seven bands from government to non-government use. Some of the spectrum will be put up for bid in public auctions. The Commission allocated the 216-220 MHz band to the fixed and

mobile services (co-primary), although some government systems in the band will remain.

"We are pleased that the FCC has found suitable spectrum for MicroTrax and AeroAstro other than at 2300-2305 MHz," ARRL Executive Vice President David Sumner, K1ZZ, referring to two commercial competitors. "We hope this will clear the way for an upgrade to primary status at 2300-2305 MHz for the Amateur Service."

MicroTrax has sought access to 2300 to 2305 MHz and other bands for a proposed Personal Location and Monitoring System to enable tracking of people and objects. AeroAstro has proposed sharing the band with amateurs on a co-primary basis for its Satellite Enabled Notification System global messaging system. Both indicated interest in the 1670-1675-MHz band; MicroTrax also has said that 2385-2390 MHz might be a good fit. The FCC also noted comments from ArrayCom that the 1670-1675-MHz band would be suitable for its i-BURST high-speed data system, now operating experimentally at 2.3 GHz.

Sumner was less enthusiastic about the FCC's action at 216-220 MHz as it impacts the Amateur Service. "While the limited secondary allocation to the Amateur Service at 219-220 MHz is being maintained, the more intensive use of 216-220 MHz by commercial services is likely to preclude amateur use of the band in many parts of the country," he commented.

The amateur allocation at 219-220 MHz is secondary to the Automated Maritime Telecommunications System (AMTS). Within the 1 MHz of spectrum, Amateurs may install and operate point-to-point digital message-forwarding systems, but only under strict limitations that require coordination with and sometimes approval by AMTS licensees. The ARRL had hoped to expand opportunities for point-to-point digital messaging systems, but the FCC said amateurs already have access to other bands for that purpose and denied the request.

The Order in ET Docket 00-221 is available on the FCC Web site <http://www.fcc.gov/Bureaus/Engineering_Technology/Orders/2001/fcc01382.pdf>

Vote on QST Cover Plaque Award

The winner of the QST Cover Plaque Award for December 2001 was our Packrat club member Joe Taylor, K1JT, for his article "WSJT: New Software for VHF Meteor-Scatter Communication." Congratulations, Joe! The winner of the QST Cover Plaque award--given to the author of the best article in each issue--is determined by a vote of ARRL members. Voting takes place each month on the Cover Plaque Poll Web page, <<http://www.arrl.org/members-only/qstvote.html>>.

Page 113 of the Feb issue of QST under the EPA Section news gives a good write up on our member Paul Sokoloff, WA3GFZ, for his organization of a ham radio booth at a technical show in Philadelphia, well staffed by our elected ARRL officials.

via W3IIT

Microwave Update 2002

The New England Weak Signal (NEWS) group is sponsoring this years Microwave Update Conference. Interested hams should visit their website for information and updates as the details are added and registration becomes available.

Contest Rover Notes from W3IY

Many thanks for all the action! I had FUN!! I was kinda disappointed in my score, but we still had fun. Worked most of what we heard...just didn't hear enuff grids!! Contrary to popular opinion, I was calling CQ like mad on 144.233 about every 15 minutes or so...so if you didn't hear me, you weren't listening in my direction, or we didn't have condx... My little 2m beam aint that sharp!! Folks just don't point down towards FM16... The locals down there (NG4C, KN4SM, WF4R...etc) are disillusioned. Give them some action, or they will head back to HF and you will hear nothing besides the great VHF es up waterfall!! Missed many skeds to NE...just never heard stuff... Showed up for most skeds. Didn't spend as much time calling on 6m. Lotsa stations only were on for brief periods, it seemed... Torrential rain produced good rain scatter on 13, 9, 6. es 3cm bands. Wish some were there to exploit it besides K8GP es W4RX...hi. We really shoulda considered starting on the higher bands instead of working up...lost many oppurtunities. It rained cats, dogs, and mice all day Saturday until well past midnite! Got reported to police as "suspicious" in FM15 Eyeball QSL card bailed me out... minimizing police hassle (glad I had one on me) Lost the van's alternator between FM18 es FM29. Had to quit early. Limped home by tapping unused rover battery resources to run headlights and ignition system. It was getting dark fast as I pulled into the hangar. Read it and weep...(for me!) 73, **Bill W3IY/R**

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Thanks again to Matt Reilly KB1VC we have a January Score Rumors webform up at :

<http://www.newsvhf.com/janscores.html>

It's also linked from our contest page,

<http://www.newsvhf.com/contests.html>

Feel free to enter your breakdowns or check out others. Note this page is for entertainment only and does not replace submitting your logs to ARRL. -73, Ron WZ1V (from the web)

*See the results posted to date on p11 of this issue—ed*

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==>**SOLAR UPDATE** Solar seer Tad Cook, K7VVV, Seattle, Washington, reports: Average sunspot numbers rose more than nine points this week, and average solar flux dropped nearly eight points, so solar activity was about the same as last week. There weren't any days with big geomagnetic upsets. Saturday was slightly unsettled, with the planetary K index at four over two of the three-hour reporting periods. Because of lower indices earlier, the planetary A index for the day was only 11. Latest projections show stable geomagnetic conditions well into next month, with planetary A indices in the low and mid single digits. This is generally good for HF operators because of lower absorption. Predicted solar flux for Friday through Sunday is 225. NASA reported this week that the previous two solar cycles were double-peaked, and the current one is also. At one time we believed that Cycle 23 peaked in mid-2000, but then a larger peak emerged in late 2001. No doubt this explains all that fabulous F2 layer propagation on 6 meters last fall. You can read NASA's story on the Science@NASA Web site <http://science.nasa.gov/headlines/y2002/18jan_solarback.htm>. Sunspot numbers for January 17 through 23 were 122, 156, 153, 212, 187, 178 and 272 with a mean of 182.9. The 10.7 cm flux was 211.8, 210.5, 213.7, 222.2, 224.5, 228.7 and 226.5, with a mean of 219.7. Estimated planetary A indices were 6, 5, 11, 7, 9, 6 and 6 with a mean of 7.1.

From The ARRL Letter Vol. 21, No. 04 January 25, 2002

47 GHz SSB QSO in France 31 Dec 2001

The article was written by Michel, F6BVA on the French Hyper Microwave List Server. Additional info was supplied by Dominique, F5AXP, Jean-Marie, F6ETU and Michel, F6BVA in response to many questions from W3HMS. It was translated by John, W3HMS

For the last day of the year 2001, Dominique, F5AXP and Jean-Marie, F6ETU braved the cold, -3 C, and the storm on Mount Tauch (JN12IV) . For my part (Michel, F6BVA), weather wise it was no better than going on the slopes of Mount Ventoux in grid JN24PD at 1400m (about 4300 ft) a violent mistral with the temperature at -8°C/18 F. The WX was quite changeable between the morning and the afternoon QSOs. We noted that aluminum boxes were completely frozen! However, we did make a superb QSO on 47 GHz and we were at 250 Km/152 miles. SSB signals were profoundly affected by signal/QSB at levels between 51 -56. In this period of little activity, this merits some lines on the reflector (French Hyper)!! This QSB did not involve parabola movements as our tripods are stable and the mechanical apparatus was designed to avoid slippage. For my part (F6BVA), I have always stated that QSOs at distances, with or without wind, have multiple causes of QSB. For this QSO of 31 Dec, the trajectory followed very close to the coastal fringe of the Mediterranean. This is a very unstable zone, the hygrometry is very difficult to master in this zone. The force of the northern wind amplifies this phenomenon. There was as well on our path, and this inspite of the wind, a very large unstable mist which dif-fused and dispersed the signal. But to be more specific, all the contacts made by me in past at more than 150 km on 47 GHz have always been affected by QSB , even those on beautiful days with nice, warm temperatures. Thanks to Dominique, F5AXP and to Jean-Marie, F6ETU for this UFB QSO from Michel, F6BVA.

Feeds: F6ETU illuminates his offset dish by a homebrew conical horn and he used the SABOR software to determine the dimensions. The offset parabola is 1 meter/39.37 inches in diameter with an equivalent F/D of 0.6. The theoretical gain of the horn is 12.5 dB for a 3 db theoretical opening of 46 degrees. The predicted gain of the feed and dish together 51.5 dB. Michel, F6BVA said that he does not have the possibility of measuring on this band for optimizing the illumination of the parabola. He added that for his part his offset dish is illuminated directly by a homemade conical horn and that he prefers simple systems which are well-optimized.

Antennas: F6BVA uses a parabolic antenna of 80 cm (32 inches) in diameter. F5AXP uses a 1.2 meter offset.

Equipment: The 24 GHz equipment is the basic DB6NT units with amplifiers by G3ACE. On 47.1 GHz the mixer is by DB6NT with about 100 microwatts output. The local oscillators are operated on 12 VDC on both 24 and 47 GHz.

A beacon was made with a quartz thermostat with output on 430 Mhz. It is coupled to a piece of semi -rigid coax terminated by two microwave diodes to generate harmonics usable at 24 GHz and 47 GHz.. A horn antenna is used.

This QSO was started on 10 Ghz with very strong signals and ,without touching the azimuth and setting, passing to 24 GHz with equally strong signals. Then we changed the feed for 47 Ghz in front of the parabola . Then one station transmitted while the other searched for this signal on 47 GHz. Two meters was used for liaison.

It was Michel who had the worst weather environment on Mt Ventoux and who had to wait for some time before trying a QSO on 47 Ghz at 300 km/180 miles which , unfortunately, was not made. Dominique will send me (W3HMS) pix when the film is finished and processed.

BAND DESIGNATION FREQUENCIES AND WAVELENGTHS

(Owen, K6LEW, FM18lx <http://www.c3iusa.com>
<http://www.k8gp.net>)

L-Band 1-2 GHz or 15-30 cm wavelength.
S-Band 2-4 GHz or 8-15 cm wavelength.
C-Band 4-8 GHz or 4-8 cm wavelength.
X-Band 8-12 GHz or 2.5-4 cm wavelength.
K-Band 18-26.5 GHz
Ku-Band 12-18 GHz or 1.7-2.5 cm wavelength
Ka-Band 27-40 GHz or .75-1.2 cm wavelength (once referred to as R-Band)
Q-Band 33-50 GHz
U-Band 40-60 GHz
V-Band 40-75 GHz
W-Band 75-110 GHz
mm-Band 110-300 GHz
u mm-Band 300-3,000 GHz
The K band is actually split into two bands by a strong water vapor absorption line. Long ago Ku band was known as P-Band and J-Band as it was then considered two separate bands

~~~~~  
According to Jerry Whitaker, et al, "National Association of Broadcasters Engineering Handbook", 9th edition, 1999, page 6, here are the new Radar letter designations that WA2SAY mentioned, that haven't caught on very well: "Current U.S. Tri-Service Radar Band Designations"

A Band ..... 0 Hz to 250 MHz  
B 250 MHz to 500 MHz  
C 500 MHz to 1 GHz  
D 1 GHz to 2 GHz  
E 2 GHz to 3 GHz  
F ..... 3 GHz to 4 GHz  
G 4 GHz to 6 GHz  
H 6 GHz to 8 GHz  
I 8 GHz to 10 GHz  
J 10 GHz to 20 GHz  
K ..... 20 GHz to 40 GHz  
L 40 GHz to 60 GHz  
M 60 GHz to 100 GHz  
N 100 GHz to 200 GHz  
O 200 GHz to 300 GHz

The millimeter wave community has their Letter-Band designations that are indicated on a Millitech Wave Guide Gauge: MILLIMETER LETTER DESIGNATIONS BAND DESIGNATION FREQUENCY REGION WR-TYPE (Wave Guide)

Ka ..... 26.5 GHz to 40 GHz WR-28  
Q 33 GHz to 50 GHz WR-22  
U 40 GHz to 60 GHz WR-19  
V 50 GHz to 75 GHz WR-15  
E 60 GHz to 90 GHz WR-12  
W ..... 57 GHz to 110 GHz WR-10  
F 90 GHz to 140 GHz WR-8  
D 110 GHz to 170 GHz WR-6  
G 140 GHz to 220 GHz WR-5

**Dick, K2RIW.**

~~~~~  
You might go to: www.testeq.com/charts/ where you will find a list of various charts to choose from. The top one on the list - 'Waveguide Band Designations' provides a very good list. 73's, **Don W3TV**

~~~~~  
Stumbled onto an interesting web site providing information on spectrum allocations world wide from 31 to 81 GHz - very interesting to learn what's there around the world.

[http://www.superfreq.com/itu30\\_81ghz.html](http://www.superfreq.com/itu30_81ghz.html)  
Owen, K6LEW, FM18lx

## 12 Cipher Grid Program Theory and Characteristics

Dick Knadle, K2RIW

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**INTRODUCTION** -- I've recently been receiving a series of inquiries about the 12 cipher Maidenhead Grid program that I have been using for the last 9 years. As I typed up an answer for the last inquirer, I realized that some of this material may have universal interest. Therefore, I've included an edited version in this submittal. This write up also includes an explanation of how the Maidenhead Grid System works. A good programmer could read this material and write his own 12 cipher Grid Program. The 3 main advantages of a 12 cipher Grid Locating system are: (1) higher resolution (approximately equal to the resolution of the 7.7 minute series of U.S. Geologic Survey maps); (2) a more compact presentation (and storage) -- 12 Grid ciphers have the same location resolution as 14 or 15 decimal numbers of Longitude and Latitude; (3) and less confusion when the Locator is sent over a voice circuit -- with Lat. and Long., you'll ask, "is the speaker talking degrees and decimal fractions of a degree, or degrees minutes and seconds," for instance? The Grid System doesn't have those ambiguities.

**MAIDENHEAD THEORY** -- The Maidenhead Grid System first divides the World into spherical "rectangles" of 20 degrees of Longitude by 10 degrees of Latitude. Starting with the International Date line and proceeding East (from -180 degrees West longitude, to +180 degrees East longitude), the 18 possible (each 20 degrees wide) Longitude rectangles are labeled with the letters A through R, respectively. The 18 possible (each 10 degrees high) Latitude rectangles (from -90 degrees [South Pole] to +90 degrees [North Pole] ) are labeled with the letters A through R, respectively. Therefore, the first two letters of a Grid Locator go from a possible address of AA through RR. The Longitude cipher always precedes the Latitude cipher, in the whole Maidenhead System of pairs of Letters (L) and pairs of Numbers (N), in the form of -- LLNNLLNN ...

**THE FIRST RESOLUTION STEP** -- Next, each one of the 20 by 10 degree rectangles is broken up into 100 sub-squares (10 sub-squares wide by 10 sub-squares high) yielding sub-squares that are 2 degrees wide by 1 degree high. The lower left sub-square is labeled 00, the upper right sub-square is labeled 99. So far, the total 2 degree by 1 degree Grid Locator could consist of all possible addresses from AA00 through RR99.

**THE 2nd RESOLUTION STEP (NORMAL 6 CIPHER GRIDS)** -- Next each of the 2 degree by 1 degree sub-squares are divided into sub-sub-squares that are 24 squares wide by 24 squares high, and these are labeled AA through XX, with AA being the lower left corner, and XX being the upper right corner. Each of the sub-sub-squares has dimensions of 1/12 degree (5 minutes) in Longitude by 1/24 degree (2.5 minutes) in Latitude. So far, all the possible 5 minute by 2.5 minute accuracy Grid Locators (addresses) could go from AA00AA through RR99XX.

**THE 3rd RESOLUTION STEP (EXTENDED RESOLUTION)** -- What I added carries out the same system for 6 more ciphers (3 more resolution steps). The next two number ciphers divide the sub-sub-squares into boxes that are 10 boxes by 10 boxes, labeled 00 (lower left corner box) through 99 (upper right corner box). These sub-sub-sub-square boxes have dimensions of 0.5 minutes (30 seconds) of Longitude, by 0.25 minutes (15 sec-

Continued on next page

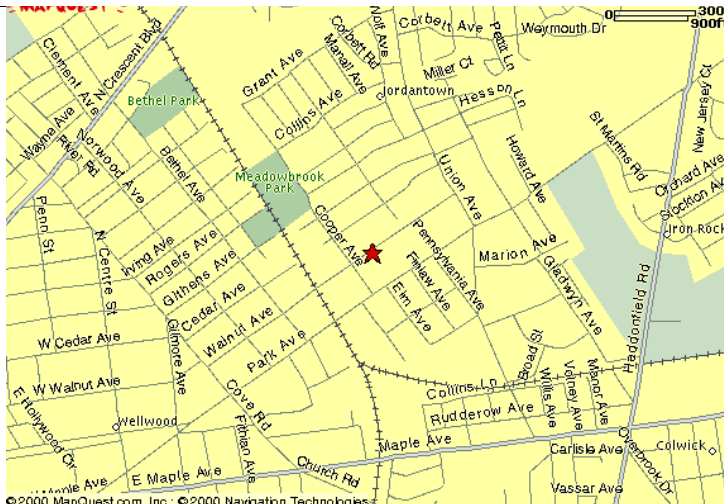
seconds) of Latitude.

**THE 4th RESOLUTION STEP** -- My next step divides those boxes into 24 boxes wide, by 24 boxes high. These boxes have the dimensions of 30/24 (or 1.25) seconds in Longitude, by 15/24 (or 0.625) seconds in Latitude, and are labeled AA through XX.

**THE 5th RESOLUTION STEP** -- My last step divides these boxes by squares that are 10 wide by 10 high, and labels them 00 through 99. These final squares have a resolution of 0.125 seconds in Longitude by 0.0625 seconds in Latitude. All possible 12 cipher Grid addresses go from AA00AA00AA00 (at the South Pole, East side of the International Date Line) through RR99XX99XX99 (at the North Pole, on the West side of the International Date Line), that's  $(18^2) * 100 * (24^2) * 100 * (24^2) * 100$  or 107.5E12 possible addresses.

**RESOLUTION REQUIREMENT** -- Most people believe that the U.S. Geological Survey 7.5 Minute Series of maps can be read to an accuracy of slightly better than 0.1 seconds in Longitude and Latitude. That's better than 100 feet in Latitude, and 75 feet in Longitude (where I live). The U.S. Geological Survey claims that one sigma error (63%) of the items on their maps can be located to an accuracy of 40 feet. So, as you can see, my 12 cipher Grid Square System has approximately the same accuracy that the maps are capable of.

**NO MORE RESOLUTION** -- If I went from my current 12 ciphers to a 14 cipher Grid system, the next step would divide the final squares by a 24 by 24 box system, and the final resolution would be more than 10:1 beyond the resolution of the best maps in non-military hands. So I stopped at 12 ciphers. **CONCLUSION** -- So that's the description of my 12 cipher grid program, with a little of it's theory of operation, and my motivation for writing it. 73 es Good VHF/UHF/SHF DX, **Dick, K2RIW, FN30HT84DC27.**



**Contest Wrap-up Sat 2-9, 10AM**  
**Bob Fischer W2SJ**  
**7258 WALNUT AVE**  
**PENNSAUKEN NJ 08109**

Check out this log page, kindly sent in by W3RJW as an example of the activity on 6m over the holiday season. Many of the club members have taken advantage of the fine conditions this winter, filling in their DXCC and VUCC awards totals.

As is often repeated, you gotta be on the air to work 'em, so make sure that you stay fired up during this exciting phase of the sunspot cycle.

I am gathering reports from all of the Packrats with their "Box Scores"...a band-by-band account of states worked, grids worked, and best DX in Km. Please submit your report in timely fashion by email to the editor at rick1ds@hotmail.com

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**7258 Walnut Avenue, Pennsauken, NJ 08110**  
**(856) 665-8488      bobw2sj@prodigy.net**

| DATE TIME | STATION CALLED | CALLED BY | HIS FREQ. OR DIAL | OTHER DATA          |
|-----------|----------------|-----------|-------------------|---------------------|
| 12/29/01  |                |           |                   |                     |
| 1308      | 9Q             | veive     |                   |                     |
| 1314      | X              | KC4BNO    |                   | LAKELAND, FLA       |
| 1324      | CQ             | WA3QTD    | 152               | VORON, USSR         |
| 1332      | X              | WB2TQE/m  |                   | Ft. Lauderdale, FLA |
| 1352      | G0ATED         | X         | .118              | Isle of Man IO74    |
| 1509      | YV4YC          | X         |                   | Venezuela FK68      |
| 12/30/01  |                |           |                   |                     |
| 1504      | JAGWFM/HR3     | X         | .194              | Honduras EK65       |
| 1510      | P25RA          | X         | .130              | Suriname GJ25       |
| 1518      | NP2BT          | X         | .230              | Puerto Rico FK78    |
| 1530      | P49MMW         | X         |                   | ARUBA FK42          |
| 1539      | TISKD          | X         | .147              | Costa Rica EK70     |
| 1547      | HP2CWB         | X         | .175              | PANAMA EJ09         |
| 1621      | HR1BY          | X         | .145              | Honduras EK64       |
| 12/31/01  |                |           |                   |                     |
| 1926      | SP2BR          | X         | .260              | Poland              |
| 1932      | OE1IEP         | X         | .255              | Denmark J055        |
| 1934      | DJ4AX          | X         |                   | Germany J031        |
| 1507      | UT7QF          | X         | .1085             | UKRAINE KN77        |
| 1513      | U55QL          | X         | .120              | UKRAINE KN66        |
| 1516      | SV7BOT         | X         |                   | Greece KN21         |
| 1517      | UR7GG          | X         | .125              | UKRAINE KN66        |
| 1535      | UT7GA          | X         | .140              | UKRAINE KN66        |
| 1546      | Y04FRT/P       | X         |                   | Romania KN34        |
| 1607      | B51EV          | X         | .135              | Slovenia JN76       |
| 1609      | 9A1CMF         | X         | .142              | CROATIA JN86        |
| 11/1/02   |                |           |                   |                     |
| 1457      | CU8AO          | X         | .125              | Azores HM49         |





**Bd of Dir Mtg Thu 2-14 8PM  
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## **CENTRAL STATES VHF SOCIETY CALL FOR PAPERS**

The Central States VHF Society will be holding it's 36th Annual Conference this year in Milwaukee, Wisconsin. It will be held at the Sheraton Four Points on July 26-28, 2002. As the Technical Program Chairman this year, I would like to invite interested authors to present a paper for the Conference. Any topic related to weak-signal VHF operation is welcome, but if you need one, here are some suggestions: Practical omnidirectional antenna designs (Alford slots, Loops, others) Basic pre-amp concepts - gain, intercept point, and noise figure (and their interactions) New devices and how to implement them Modern meteor scatter techniques and software (especially WSJT) Good audio - how can it help you catch those distant grids PSK31 and it applications at VHF and above Tower and or fixed station ideas. How to actually fit antennas for 10 different bands on the same mast AO-40 operation for when the bands are "down" First-time roving tips and techniques PCB Construction Techniques EME with small dishes.

If you are interested in writing and/or presenting a paper for the 2002 Conference, please send me an email at n8kwx@csvhfs.org. Or write to: Marc Holdwick PO Box 6051 Buffalo Grove, IL, 60089 Papers are welcome in either paper or electronic format, but will be required by May 5, 2002 to be included in the Proceedings. Please contact me as soon as possible with an abstract or even a general idea. This will help the Conference team with it's planning activities. Thanks & 73! Marc - N8KWX

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## Hal Taylor, K2PT—SK

(reprinted from *HARMONICS*, Jan 2002, 86:7 South Jersey Radio Association, an exchange partner with CheeseBits)

Sorry to report that Hal Taylor died of cancer on 27 December 2001. He was born in Philadelphia and moved to the Taylor Farm in Cinnaminson when he was 9 years old. Hal attended the Friends School and earned his bachelor degree in physics from Haverford College, where he was an all-American soccer player. He then earned a Masters degree in meteorology from MIT and doctorate in physics from the University of Iowa. He joined the faculty at Stockton College teaching physics and meteorology.

The Taylor Farm was started by his parents in 1938. The 41 acre farm now specializes in "pick-your-own" organic fruit and vegetables. This is the last farm fronting the Delaware River in this part of New Jersey. You have no trouble finding it, just take Taylor's Lane off Route 130 and head for the river. Hal and his wife Suzanne had lived on the farm for the last ten years and managed the business. He commuted 60 miles each way to his teaching job at Stockton College.

Hal and his younger brother Joe got interested in amateur radio in their teens. They specialized in VHF and UHF and built all their own equipment. Living on a farm, they had lots of room to put up antennas. They were great VHF contest operators and turned their excellent scores to SJRA. During the 1950's they were on the Harmonics staff and turned out a monthly column entitled "50 MHz." Their calls at that time were K2ITQ for Hal and K2ITP for Joe, who is now K1JT. Often referred to as the Taylor twins, Hal and Joe recently set up some 160 meter antennas on the farm and had fun operating in the ARRL 160 meter contests.

The membership of SJRA is saddened to hear of Hal's passing and extends their condolences to the Taylor family.

The January Board of Directors meeting was held at Joe Taylor's home, and flowers were given to the family by Ernie Kenas, W3KKN, in honor of Hal's memory. The Packrats club members and Board of Directors extend their sympathies to the Taylor family on their loss.

### ARLS001 New Amateur Radio Antenna to be Installed During Spacewalk

Amateur Radio on the International Space Station Board Chairman Frank Bauer, KA3HDO, has announced that one of the four new ARISS antennas could be installed as soon as next week. It's anticipated that the "WA3" VHF-UHF flexible tape antenna will be installed on one end of the ISS Service Module during a scheduled January 14 spacewalk--or EVA. "The Russian team is able to deploy this particular antenna sooner than the others because it is located very close to where the four RF connections go into the Service Module," Bauer said.

Expedition Four Commander Yuri Onufrienko, RK3DUO, and flight engineers Carl Walz, KC5TIE, and Dan Bursch, KD5PNU, are beginning their second month in orbit aboard the ISS. They have not yet been active on Amateur Radio, although several ARISS school contacts are pending. Onufrienko and Walz will carry out the EVA. NASA says the two will move a Russian cargo crane to the Russian Functional Cargo Block for future assembly work. Bursch will operate the Canadarm2 robotic arm from inside the space station. "Installation of the new antenna on the Service Module paves the way for two separate ham stations aboard Space Station Alpha. Plans call for a 2-meter station to remain in the Functional Cargo Block using the Russian antennas that had been used to dock the FGB but now used for ARISS. A second 70-cm station will be set up in the Service Module using the new antenna.

## You Might be a HAM if.....

You know the Latitude and Longitude of your home QTH.  
You ask for a Bird 43 for a Father's day gift.  
You receive a Bird 43 for a Father's day gift.  
You calculate the HAAT for your new QTH before you sign the loan papers.  
Your teenager refuses to ride in your car because it looks like a porcupine  
Your XYL refuses to ride in your car because all the radios give her a headache.  
You ever replaced a perfectly good car battery just to get a higher capacity one.  
Your criterion for a new QTH includes ground elevation, and no antenna restrictions.  
You ever received a TVI complaint.  
Your neighbor threatened to call the FCC for you interfering with an electronic device in their house.  
You ever had an antenna fall down.  
You ever had the same roll of coax up at 3 different locations.  
Your XYL accuses you of moving all those boxes of wire for the last 20 years, but never using any of it.  
You wear a watch that displays time in a 24-hour format.  
The local Radio Shack knows you by name.  
You consider an ARRL repeater directory a necessary glove box item.  
You ever took a detour just to look at a new tower that has sprung up.  
You use your ham call as a computer password.  
You ever used your ham call as a part of an email address.  
You ever bought a ham study guide for another family member in hopes of getting them interested.  
You plan your vacation to take in as many hamfests as possible.  
You ever tapped out HI in Morse on your car horn to another ham.  
You ever took a spring vacation to Ohio, so you could drop in on Dayton.  
You go to an antique flea market with the XYL, just so she would feel guilty when you wanted to go the ham flea market.  
Your call sign shows up on your business cards.  
You ever put a GPS tracker in the XYL's car, just so you could watch her on APRS.  
You and the XYL took a cruise so you could visit the radio room.  
Ham radio magazines comprise more than 50% of your bathroom library.  
A ham radio activity is included in your business resume.  
You factor in a few extra hours on a business trip so you can visit a ham radio retail establishment  
You ever fell off a ladder while putting up an antenna.  
You ever put up an antenna in a snow storm.  
You ever had to patch your roof after an antenna project  
Your teenager thinks all your friends are weird.  
You have many other interests, but over the years keep ham radio as a core activity.  
And, you might be a HAM if..... You can add at least five other items to this list! (*tx to Norm Gertz, WIAA for passing this on*)

### Microwave Update 2002 Info

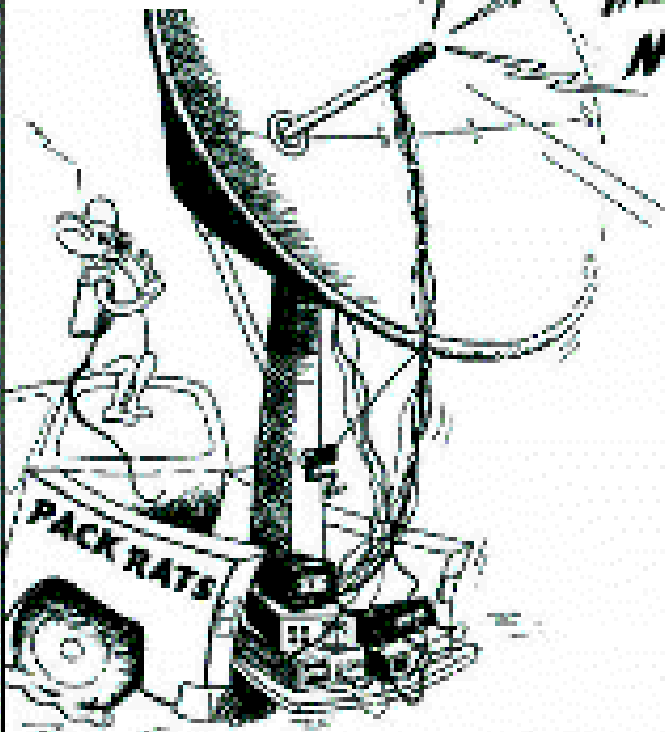
Is available at:

<http://www.newsvhf.com/mud2002.html>

| Call   | Grid  | Class | Total Points | Band QSOs/Grids |        | From the NEWS Rumored Scores self-reported January VHF SS 2002 web site |        |       |       |       |       |      |      |     |     |      |
|--------|-------|-------|--------------|-----------------|--------|-------------------------------------------------------------------------|--------|-------|-------|-------|-------|------|------|-----|-----|------|
|        |       |       |              | 6m              | 2m     | 222                                                                     | 432    | 903   | 1.2G  | 2.3G  | 3.4G  | 5.7G | 10G  | 24G | LAS |      |
| AA1YN  | FN43  | Y S   | 12780        | 89/19           | 59/11  | 26/8                                                                    | 42/7   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| AA3GN  | FN20  | N H   | 80332        | 58/10           | 203/25 | 68/13                                                                   | 38/7   | 30/7  | 38/6  | 24/4  | 13/3  | -    | -    | -   | -   | 2/1  |
| AFIT   | FN43  | Y S   | 135261       | 247/57          | 138/21 | 59/14                                                                   | 73/15  | 20/5  | 24/6  | 8/5   | 3/2   | 3/3  | 9/4  | -   | -   | 1/1  |
| KIDS   | FN20  | N R   | 43706        | 62/3            | 66/7   | 71/7                                                                    | 66/8   | 22/3  | 26/3  | 21/2  | 12/1  | 6/1  | 5/1  | 1/1 | -   | 14/2 |
| KIDY   | ROVER | Y R   | 14706        | 55/20           | 79/16  | 31/8                                                                    | 31/8   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| K1GX   | FN31  | Y H   | 114932       | 156/37          | 164/24 | 57/14                                                                   | 78/16  | 27/9  | 35/8  | 8/4   | 5/3   | 1/1  | 3/2  | -   | -   | -    |
| K1IM   | FN31  | N S   | 18450        | 267/38          | -      | -                                                                       | 51/12  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| K1JT   | FN20  | N S   | 129625       | 262/46          | 221/33 | 97/20                                                                   | 128/20 | 19/4  | 7/2   | -     | -     | -    | -    | -   | -   | -    |
| K1LPS  | FN34  | Y H   | 11426        | 49/20           | 40/14  | 18/8                                                                    | 20/8   | 4/4   | 4/4   | -     | -     | -    | -    | -   | -   | -    |
| K1TEO  | FN31  | Y H   | 386973       | 296/63          | 355/43 | 119/31                                                                  | 149/36 | 37/15 | 58/17 | 15/8  | 7/4   | -    | 3/2  | -   | -   | -    |
| K1TR   | FN42  | N H   | 86412        | 182/42          | 160/27 | 70/19                                                                   | 84/17  | 10/4  | 17/5  | -     | -     | -    | -    | -   | -   | -    |
| K1UHF  | FN31  | Y H   | 186636       | 199/42          | 391/42 | 85/26                                                                   | 108/25 | -     | 31/6  | 9/4   | -     | -    | 8/6  | -   | -   | -    |
| K1WVX  | FN31  | Y S   | 3475         | 35/9            | 36/9   | 11/3                                                                    | 13/2   | -     | 5/2   | -     | -     | -    | -    | -   | -   | -    |
| K2AXX  | FN12  | N H   | 252126       | 165/51          | 164/36 | 71/22                                                                   | 95/23  | 29/9  | 36/14 | 22/5  | 16/5  | 10/4 | 18/5 | -   | -   | -    |
| K2GXT  | FN13  | N U   | 11220        | 86/17           | 118/5  | 4/2                                                                     | 75/4   | -     | 3/2   | -     | -     | -    | -    | -   | -   | -    |
| K2LDT  | ROVER | N R   | 17712        | 7/4             | 11/6   | 9/6                                                                     | 10/5   | 10/5  | 10/6  | 6/4   | 8/5   | 6/5  | 4/3  | -   | -   | -    |
| K2UOP  | FM09  | N H   | 60710        | 112/41          | 103/33 | 33/20                                                                   | 39/21  | 5/3   | 16/9  | 3/3   | -     | -    | -    | -   | -   | -    |
| K3DNE  | FM19  | N H   | 148170       | 227/57          | 205/38 | 68/21                                                                   | 83/28  | 19/9  | 22/12 | -     | -     | -    | -    | -   | -   | -    |
| K3MD   | FN10  | N H   | 18792        | 61/24           | 94/22  | 25/12                                                                   | 20/10  | -     | 4/4   | -     | -     | -    | -    | -   | -   | -    |
| K3MJW  | FN00  | N L   | 8268         | 43/16           | 41/16  | 16/11                                                                   | 20/10  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| K5LLL  | EM10  | N U   | 37130        | 56/29           | 71/23  | 19/12                                                                   | 27/11  | 9/6   | 11/5  | 10/6  | 2/2   | -    | -    | -   | -   | -    |
| K5VH   | EM00  | N H   | 21420        | 12/5            | 38/17  | 14/10                                                                   | 17/8   | 5/4   | 8/4   | 10/6  | 6/4   | -    | 6/5  | -   | -   | -    |
| K6LEW  | FM18  | N S   | 448          | 9/5             | 11/5   | 2/2                                                                     | 4/2    | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| K7CW   | CN87  | N H   | 16115        | 293/55          | -      | -                                                                       | -      | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| K7YO   | CN85  | N S   | 7486         | 55/20           | 48/9   | 17/2                                                                    | 30/7   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| K8CC   | EN82  | N L   | 73945        | 190/37          | 219/42 | 16/11                                                                   | 101/25 | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| K8GP   | FM18  | N U   | 673246       | 458/67          | 481/54 | 129/35                                                                  | 229/39 | 34/15 | 49/15 | 24/11 | 18/12 | 13/9 | 13/9 | -   | -   | -    |
| KA1EKR | FN42  | Y S   | 6014         | -               | 60/13  | 23/7                                                                    | 28/7   | -     | 8/4   | -     | -     | -    | -    | -   | -   | -    |
| KA1ZE  | FN20  | Y H   | 97240        | 120/19          | 165/33 | 53/15                                                                   | 66/17  | 21/7  | 28/8  | 9/2   | 8/1   | 6/1  | 4/1  | -   | -   | -    |
| KA2FIR | FN20  | N S   | 1            | -               | 1/1    | -                                                                       | -      | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| KA6AMD | DM15  | N Q   | 10857        | 29/10           | 66/16  | 26/10                                                                   | 42/11  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| KB1EAA | ROVER | N R   | 12189        | 67/10           | 66/13  | 22/7                                                                    | 31/9   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| KB8VAO | EN91  | N H   | 5280         | 38/17           | 34/18  | 4/4                                                                     | 15/9   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| KC4AUF | FM17  | N S   | 7938         | 55/19           | 45/13  | 16/9                                                                    | 15/8   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| KE8FD  | EM84  | N H   | 43068        | 93/39           | 99/30  | 32/16                                                                   | 50/18  | 2/2   | 6/6   | -     | -     | -    | -    | -   | -   | -    |
| KF6AJ  | FN31  | Y S   | 28860        | 107/23          | 105/16 | 56/13                                                                   | 60/13  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| KF6MXK | CM87  | N S   | 4930         | 46/14           | 50/7   | 11/3                                                                    | 26/5   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| KF8QL  | EN72  | N S   | 14697        | 48/19           | 61/21  | 14/11                                                                   | 28/13  | 3/3   | 2/2   | -     | -     | -    | -    | -   | -   | -    |
| KG4BMH | EM76  | N H   | 7600         | 18/8            | 132/41 | -                                                                       | 1/1    | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| KG9PF  | ROVER | N R   | 91520        | 147/12          | 287/21 | 113/15                                                                  | 154/14 | -     | 44/8  | -     | -     | -    | -    | -   | -   | -    |
| KJ1K   | ROVER | Y R   | 10038        | 11/6            | 48/10  | 17/5                                                                    | 39/8   | 8/3   | 9/4   | -     | -     | -    | -    | -   | -   | -    |
| KM5ES  | EM25  | N S   | 1728         | -               | 54/32  | -                                                                       | -      | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| KU8E   | EN80  | N S   | 4914         | 39/15           | 47/16  | -                                                                       | 20/8   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| N1DPM  | FN32  | Y S   | 23912        | 55/18           | 45/11  | 34/10                                                                   | 40/10  | 10/5  | 8/2   | 3/2   | 5/2   | -    | 1/1  | -   | -   | -    |
| N1MU   | ROVER | N R   | 55298        | 41/10           | 92/15  | 20/8                                                                    | 31/11  | 17/7  | 17/8  | 12/4  | 11/7  | 5/5  | 6/3  | -   | -   | -    |
| N2DY   | FN30  | N H   | 14335        | 66/16           | 67/11  | 33/9                                                                    | 39/8   | -     | 7/3   | -     | -     | -    | -    | -   | -   | -    |
| N2EZS  | FN13  | N S   | 16023        | 66/14           | 109/17 | 34/9                                                                    | 40/8   | -     | 1/1   | -     | -     | -    | -    | -   | -   | -    |
| N2FKF  | FN30  | N H   | 13840        | 51/9            | 165/18 | -                                                                       | 37/8   | -     | 14/5  | -     | -     | -    | -    | -   | -   | -    |
| N2IM   | ROVER | N R   | 17745        | 41/4            | 94/8   | 43/5                                                                    | 41/4   | -     | 1/1   | -     | -     | -    | 14/4 | 1/1 | -   | 10/4 |
| N2JH   | FN02  | N S   | 19095        | 9/5             | 108/26 | 37/19                                                                   | 47/17  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| N2UD   | FN22  | Y S   | 1332         | 11/2            | 35/11  | 2/1                                                                     | 12/4   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| N3AWS  | EM90  | N Q   | 50           | 5/3             | 5/2    | -                                                                       | -      | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| N3HBX  | FM19  | N H   | 93269        | 288/69          | 155/29 | 36/16                                                                   | 52/19  | -     | 13/6  | -     | -     | -    | -    | -   | -   | -    |
| N6DN   | ROVER | N R   | 129918       | 115/17          | 178/21 | 84/16                                                                   | 136/19 | 27/10 | 51/15 | 7/7   | -     | -    | -    | -   | -   | -    |
| N6MU   | DM05  | N S   | 35190        | 171/30          | 149/22 | -                                                                       | 95/17  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| N6ZE   | DM04  | N R   | 1900         | 17/5            | 39/7   | -                                                                       | 22/5   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| N7IR   | DM43  | N S   | 1044         | 15/6            | 17/6   | 2/2                                                                     | 11/4   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| NC1I   | FN32  | Y H   | 40256        | 134/30          | 228/26 | 91/18                                                                   | -      | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| NE0P   | EM04  | N S   | 3294         | 21/4            | 37/12  | 3/1                                                                     | 17/7   | -     | 6/3   | -     | -     | -    | -    | -   | -   | -    |
| NJ2F   | EL96  | N H   | 11750        | 78/30           | 59/10  | 18/4                                                                    | 31/6   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| NL7CO  | EM04  | N S   | 7254         | 5/1             | 109/25 | 27/12                                                                   | 9/1    | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| VA3KA  | FN15  | N S   | 5160         | 29/12           | 46/16  | 6/4                                                                     | 21/8   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| VA3OR  | FN14  | N S   | 350          | 25/14           | -      | -                                                                       | -      | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| VE2ZP  | FN25  | N S   | 6834         | 50/23           | 36/16  | 11/6                                                                    | 13/6   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| VE3TMG | EN82  | N S   | 19520        | 61/13           | 133/29 | -                                                                       | 63/19  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| VG3EF  | FN03  | N L   | 6240         | 21/9            | 89/21  | -                                                                       | 23/10  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| W0GHZ  | EN34  | N H   | 62656        | 73/20           | 119/20 | 39/11                                                                   | 75/14  | 22/8  | 23/8  | 10/5  | 3/3   | -    | -    | -   | -   | -    |
| W0ZQ   | EN34  | N H   | 57681        | 69/17           | 120/22 | 45/13                                                                   | 76/16  | 18/8  | 24/7  | 7/3   | -     | -    | 1/1  | -   | -   | -    |
| W1MRQ  | FN43  | Y H   | 5049         | 22/5            | 49/15  | 20/8                                                                    | 17/4   | -     | 1/1   | -     | -     | -    | -    | -   | -   | -    |
| W1PM   | FN41  | Y S   | 45305        | 140/34          | 111/17 | 46/14                                                                   | 55/11  | 7/4   | 13/5  | -     | -     | -    | -    | -   | -   | -    |
| W1RZF  | FN42  | Y H   | 23220        | 71/11           | 129/21 | 45/10                                                                   | 70/12  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| W1VHF  | FN41  | N L   | 57474        | 437/85          | 73/13  | -                                                                       | 24/5   | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| W1ZC   | FN42  | Y H   | 8360         | -               | 92/21  | -                                                                       | 64/17  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| W2FU   | FN13  | N U   | 664752       | 349/64          | 409/57 | 108/35                                                                  | 172/36 | 45/16 | 49/21 | 33/12 | 26/8  | 16/6 | 23/7 | 1/1 | -   | 4/1  |
| W3EP   | FN31  | Y H   | 61712        | 307/68          | 131/28 | -                                                                       | 37/17  | -     | 5/3   | -     | -     | -    | -    | -   | -   | -    |
| W3IY   | ROVER | N R   | 84960        | 50/18           | 122/16 | 54/10                                                                   | 72/13  | 25/7  | 23/7  | 15/3  | 12/3  | 7/2  | 7/2  | -   | -   | -    |
| W3SE   | DM04  | N Q   | 40328        | 77/21           | 111/15 | 48/9                                                                    | 86/14  | 6/5   | 22/7  | -     | -     | -    | -    | -   | -   | -    |
| W3SO   | FN00  | N L   | 128856       | 277/67          | 248/52 | 35/19                                                                   | 86/30  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| W4EUH  | EM74  | N S   | 31768        | 98/32           | 111/28 | 25/14                                                                   | 51/14  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| W4MYA  | FM07  | N L   | 38064        | 217/62          | 105/28 | -                                                                       | 22/14  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| W5GVE  | EL09  | N R   | 30           | 2/2             | 3/3    | -                                                                       | -      | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| W7PW   | DM09  | N S   | 416          | 20/14           | 6/2    | -                                                                       | -      | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| W9SZ   | EN50  | N Q   | 140          | -               | 6/6    | 2/2                                                                     | 2/2    | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| WA3GFZ | FN20  | N S   | 86095        | 92/14           | 139/13 | 79/9                                                                    | 84/10  | 28/3  | 46/7  | 21/4  | 13/2  | 10/2 | 8/2  | -   | -   | 2/1  |
| WB2SIH | FN31  | N S   | 38610        | 67/14           | 154/22 | 66/13                                                                   | 84/13  | -     | 16/4  | -     | -     | -    | -    | -   | -   | -    |
| WB9Z   | EN60  | N H   | 117075       | 284/94          | 137/29 | 40/22                                                                   | 54/19  | -     | 15/11 | -     | -     | -    | -    | -   | -   | -    |
| WO9S   | EN61  | N S   | 21507        | 106/31          | 113/22 | -                                                                       | 51/14  | -     | -     | -     | -     | -    | -    | -   | -   | -    |
| WZ1V   | FN31  | Y H   | 160460       | 244/47          | 190/30 | 97/20                                                                   | 99/21  | 24/8  | 36/11 | 5/3   | 3/2   | -    | -    | -   | -   | -    |

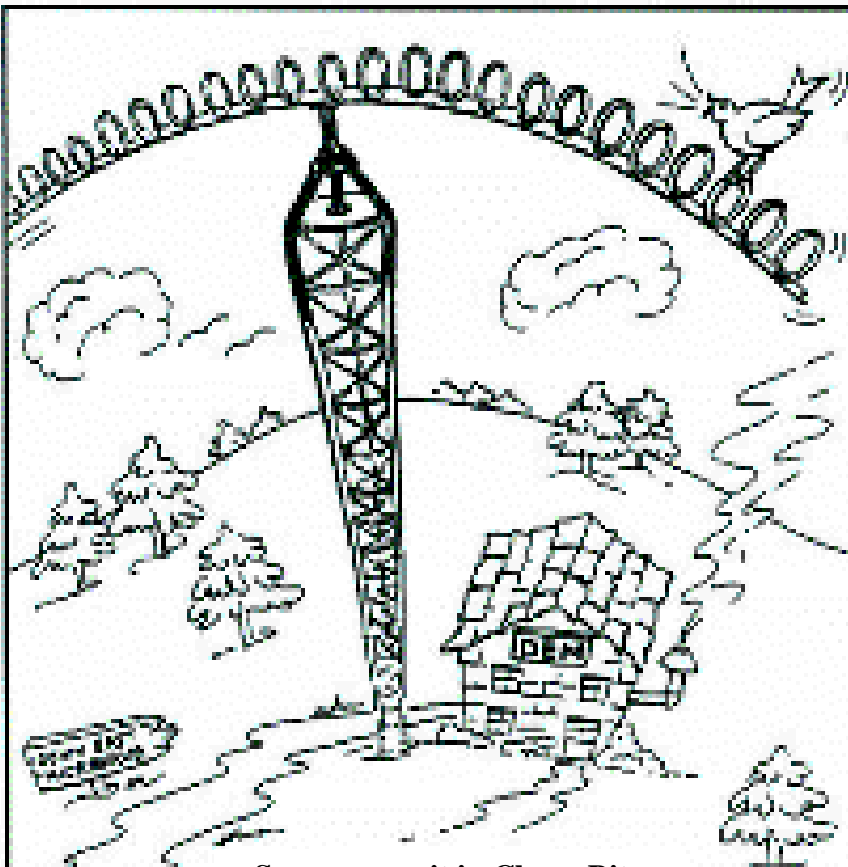
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