Broadband Over Power Lines (BPL)

As noted in previous newsletters, the CVARC Board has voted to take a "front line" role in fighting to keep our bands usable, by opposing the "Broadband over Power Lines" (BPL) initiative being considered by the FCC. The BPL system uses existing electrical distribution lines to deliver broadband internet services. Extensive test conducted by the ARRL and others show that BPL creates massive interference with the reception of broadcast, shortwave and amateur radio communications. Yet the proposal to authorize use of BPL on a nationwide scale continues to move forward fueled by powerful utility interests.

In December, CVARC Treasurer Mike Pershing, KD6IJF, sent a check to the ARRL covering donations from CVARC members plus $105 in CVARC matching funds. To date, the total in CVARC member contributions plus CVARC matching funds donated to the effort is $210. We would like to send a second check to the ARRL in February to help fund this critical battle. If you would like to help in this important effort, give your contribution to Mike Pershing at either the January or February CVARC General Meeting. If we each contributed just $5, it would make a significant contribution.

CVARC Amateur Radio Class Begins On January 13

The next CVARC Amateur Radio Class for prospective Amateur (Ham) Radio operators will begin on January 13, 2004. The class will be held each Tuesday evening from 7 p.m. to 8:45 at the Church of Jesus Christ of Latter Day Saints located at 3645 Moorpark Road in Thousand Oaks. There is a charge of $20, which covers the cost of the study manual and classroom materials. The class will culminate just prior to the FCC License examinations scheduled for February 8 at the East County Sheriff ✗s Station in Thousand Oaks. There is no minimum age requirement for FCC licensing. Family members are encouraged to attend, no previous technical knowledge is required. Interested persons should contact Karl Moody at (805) 523-0622.

FCC License Examinations - Next Exam February 8th

By Jeff Reinhardt, AA6JR

CVARC hosts FCC License Examinations at 8:30 AM on the second Sunday of even numbered months at the Ventura East County Sheriff Station on Olsen Rd. (near the Reagan Library). CVARC conducts exams for all license classes . Exam candidates must bring a form of government issued photo I.D., the original AND a photocopy of any existing license or Certificate of Exam Element Completion, a Social Security (or government issued Taxpayer I.D.) number, and $12 ARRL VE Exam fee (cash is preferred). No advance reservation is necessary, walk-ins are welcome. Advance notice is needed for special circumstances, such as reading the exam to sight-impaired candidates. If you have any questions, contact

CVARC VE Coordinator Jeff Reinhardt at 818-706-3853.

Southern California Radio-orienteering January 11

Submitted by Rob Hanson, W6RH

The next Southern California radio-orienteering event will take place in Griffith Park on Sunday, January 11, 2004. This session is being hosted by Marvin Johnston KE6HTS as part of a regular meeting of the Los Angeles Orienteering Club (LAOC). There will be a full-sized 5-transmitter international-rules two-meter course, ideal for training for the USA ARDF Championships in summer 2004. In addition, there will be several easy-to-find two-meter transmitters for beginners, plus one or more 80-meter transmitters. Participants should plan to arrive at 9:30 so you can get registered early and have time for more than one course. Start point is in the Mineral Wells picnic area in the northeast part of Griffith Park, nearby to "Travel Town." Look for signs and an orange-and-white orienteering flag at the starting site. A map to the site is at www.homingin.com. Two-meter talk-in will be on 146.970 simplex. Questions about this event should be directed to Marvin Johnston KE6HTS <marvin@rain.org> General information on radio-orienteering is at www.homingin.com

---

New Abbreviation for the E-mail "@" Sign in Morse Code

By Alan Masson, K6PSP/G3PSP

David Pratt, G4DMP, who has long campaigned for there to be a Morse code sequence for the "at" sign (@) used in e-mail addresses, has reported that the ITU has now come up with an official recommendation for just this. It is "di-dah-dah-di-dah-dit", or "AC" run together. It may take six months before it becomes an official recommendation.

There is more information about this on the ARRL website at http://www.arrl.org/news/stories/2003/12/10/2/.

FRS in the UK

By Steve Champion, AE6NX

My family are avid users of FRS radios ∃ we use them to keep in touch with each other at the mall, in museums, between vehicles, or at theme parks. So, in preparing for our trip to the UK (which was going to include PLENTY of museums) I thought I should check whether my FRS radios would be compatible with the UK system.

It did not surprise me to find that the European frequency allocation is different, but it was not until I had actually purchased a cheap pair of radios in the UK that I realized that they operate in the US 440MHz Amateur Band.

The European equivalent of FRS is known as PMR446 and consists of eight 12.5kHz channels starting with Channel 1 at 446.00625MHz. This is just above the UK 70cm band which only goes up to 440.000MHz. The PMR446 output level is 500mW, the same as FRS.

The most obvious effect of this choice of frequencies is that occasionally European visitors to the USA using their PMR446 radios without knowledge of the different frequency allocation will be operating illegally in an Amateur Band.

On the other hand, it seems that licensed US amateurs could possibly make use of these radios, unmodified, for localized simplex purposes.

The current 440MHz band plan calls for 20kHz channel spacing in this vicinity, with a simplex calling channel at 446.000MHz and repeater outputs on 446.020, 040, 060, 080 and 446.100MHz.

Obviously with PMR446 Channel 1 being only 6.25kHz above the calling channel it would not be a good choice for simplex operation, but the other channels could arguably be used for simplex operation where they do not conflict with a local repeater output. Even though the channels clearly do not conform to the voluntary band plan the radios should be able to inter-operate with many 440 rigs. Even 5kHz steps would get you within 1500Hz of the PMR446 channels.

It is not very likely that I will make extensive use of these radios in the US, but it was a nice feeling to think I was getting something for nothing † or at least a 440 hand-held for fifteen bucks!

Maximum Usable Angle

By Ken Larson, KJ6RZ

We are all relatively familiar with the term maximum usable frequency since it often appears as a question on amateur radio license exams. Maximum usable angle is the other half of the maximum usable frequency equation.

Maximum usable frequency is important for determining the best HF frequency to use in communicating between two locations, for example between Los Angles and Denver. The maximum usable frequency depends in part on the distance between to two locations. Thus the maximum usable frequency for communicating between Los Angles and San Diego will be different from that to communicate between Los Angles and Denver. In the past, maximum usable frequency was very important to professional communicators who were interested in operating full time HF communication circuits between specific locations, for example from Guam to North West Cape Australia. Today commercial HF circuits are probably less important than in the past because of the wide availability of communication satellites. Maximum usable frequency is still important to amateur radio operators interested in scheduling contacts with distant friends, communicating with a specific country, and in operating regional ARES/RACES HF emergency communication circuits.

For general amateur radio work, however, maximum usable angle is probably more important than maximum usable frequency. Maximum usable angle focuses on band availability, the types of antennas needed to take advantage of band openings, and the skip distances that can be expected.

To understand maximum usable angle, and it implications, we must start with the maximum usable frequency equation. The maximum usable frequency for communicating between two locations is:

$F_m = F_o / (\sin A_e)$

In this equation F_o is the critical frequency for the F layer of the Ionosphere. F_o is the highest frequency signal that can be transmitted directly upward, reflected by the Ionosphere, and return to Earth. The critical frequency F_o varies throughout the day, seasonally, and in accordance with the 11 year solar sunspot cycle. F_o is at its lowest value of the day, typically around 4 MHz, in the morning just before sunrise. It rises quickly during the morning reaching a maximum of around 9 MHz at noon, and then decreases throughout the afternoon and night reaching a minimum again the following morning. At noon during a solar sunspot maximum, F_o may be as high as 14 MHz. During a sunspot minimum, F_o may be 3 MHz or less prior to sunrise and reach only 5 MHz at mid day.

The angle A_e is the elevation angle, with respect to horizontal ground, of the transmitted signal as it leaves the antenna. (Actually, the vertical radiation pattern for an antenna can be quite complicated, so the angle A_e referred to here is the angle of the main lobe in the vertical radiation pattern.) For the maximum usable frequency equation, A_e is the angle at which a signal must be transmitted to reach the desired location. As shown in Figure 1, a small or low elevation angle A_{ea} causes the transmitted signal to travel a long distance, refracting in the Ionosphere and returning to Earth at location A. The maximum usable frequency for this elevation angle is F_{ma}. Any frequency less than F_{ma}, transmitted at an angle of A_e will also be refracted by the Ionosphere and return to Earth. However, frequencies greater than F_{ma} will pass through the Ionosphere and be lost to outer space. If the elevation angle is increase to A_{eb} , the transmitted signal will travel a shorter distance returning to Earth at point B. The maximum usable frequency fMB will also be less than F_{ma}. If the elevation angle is increased to A_{et} = 90 degrees, the transmitted signal will travel straight up, be reflected by the Ionosphere, and travel straight down again to the transmitting location T. At an angle A_{et} = 90 degrees, the maximum usable frequency fMT is equal to the critical frequency F_o.

The main lobe elevation angle depends on the configuration of the transmitting antenna. Vertical antennas have low elevation angles while horizontal dipoles and yagi antennas have low to high elevation angles depending on their height (measured in wavelengths) above ground, as shown in the table below. The numbers in parentheses are the angles for the -3db points on the antenna's main lobe.

Table 1

Antennas	Elevation Angle in Degrees
Vertical	
1/4 wavelength long	28 (15 - 40)

3/8 wavelength long	23 (12 - 35)
1/2 wavelength long	18 (09 - 25)
5/8 wavelength long	12 (07 - 18)
Hortizontal Dipole	
1/8 wavelength long above ground	90 (55 for lower 3db point)
1/4 wavelength long above ground	60 (38 - 82)
1/2 wavelength long above ground	30 (18 - 40)
3/4 wavelength long above ground	21 (14 - 28)
One wavelength long above ground	17 (09 - 19)
Hortizontal Yagi	
1/4 wavelength long above ground	43 (32 - 54)
1/2 wavelength long above ground	30 (18 - 38)
3/4 wavelength long above ground	21 (13 - 28)
One wavelength long above ground	17 (09 - 18)

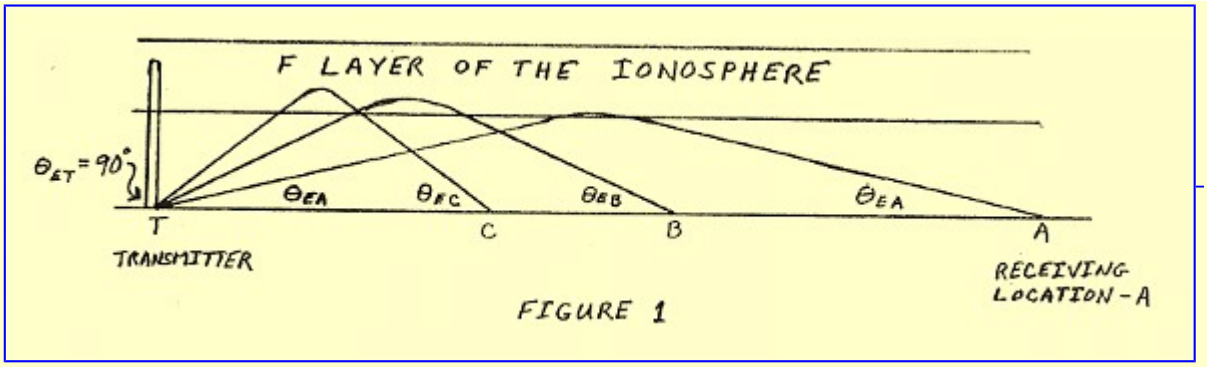

Figure 1

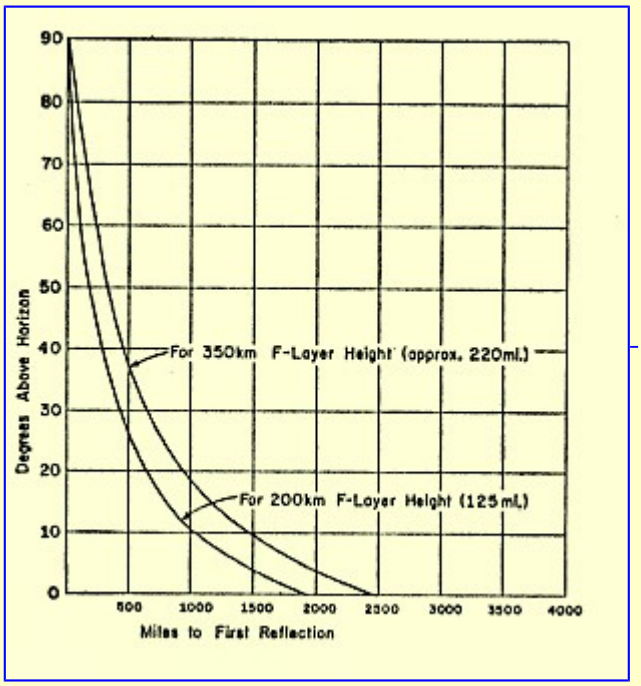

Figure 2

Figure 2 shows the ground distance covered by a signal transmitted at an angle of A_e. Denver is approximately 1025 miles from Los Angles. To travel a distance of 1025 miles, Figure 2 indicates that a single hop signal must be transmitted at an angle A_e = 18 degrees , and refract off the Ionosphere at an altitude of 220 miles, in order to return to Earth at Denver. If this transmission occurs at noon with a critical frequency of F_o = 9 MHz, then the maximum usable frequency for this transmission is $F_m = F_o / (\sin A_e)$ = 29.1 MHz. Thus communications with Denver under these conditions is possible all the way up to 10 meters. A double hop signal transmitted at an angle of 36 degrees can also be used to communicate from Los Angles to Denver. In this case, the transmitted signal will refract off the Ionosphere, return to Earth 512 miles from Los Angles, reflect from the Earth's surface, travel back up into the Ionosphere where it will be refracted a second time and finally arrive at Denver. The maximum usable frequency for this double hop path is F_m = 15.31 MHz assuming F_o = 9 MHz and A_e = 36 degrees . In this case, 20 meters is the highest usable amateur radio band for double hop communications between Los Angles and Denver. The single hop path will produce a stronger signal at Denver because it will incur lower losses than the double hop path. Using the information presented here, transmission to Denver via the single hop path can be guaranteed by using the 15, 12 or 10 meter bands. If 20 meters is used, signals may propagate to Denver via the single hop path, or the double hop path, or both. This could lead to undesirable multipath interference. Thus the best choice for communicating with Denver is to select one of the higher frequency bands that supports only the single hop propagation mode. At the same time, and under the same conditions, the maximum usable frequency for single hop communicating with San Diego (125 miles from Los Angles with a required elevation angle, shown in Figure 2, of A_e = 70 degrees) is F_m = 9.6 MHz. T hus the 40 meter band is the highest frequency amateur radio band capable of communicating between Los Angles and San Diego under these conditions.

Figure 2 shows that regional communications (communicating with stations located within 500 miles of the transmitting station) requires high transmission angles in the range from 35 degrees to 900. Regional HF communications is ideal for emergency communications work in which disaster relief organizations want to communicate with near by cities capable of sending personnel, equipment, and supplies to aid in the recovery efforts. Regional HF communications may be the only way of communicating with these cities during a natural disaster if they are beyond the reach of local VHF and UHF repeaters. DX communications, on the other hand, requires low transmission angles of 25 degrees or less to achieve transmission hops that are as long as possible.

Maximum usable angle is derived by solving the maximum usable frequency equation for A. Thus the maximum usable angle is equal to:

$$A_m = \sin^{-1}[F_o / F_b]$$

In this equation, F_o is the critical frequency as before and varies throughout the day, seasonally, and in accordance with the 11 year solar cycle.

F_b is the center frequency of the particular amateur radio band that you are interested in.

A_m is the highest angle signal that can be transmitted from an antenna and return to Earth when operating in the fB frequency band with a critical frequency of F_o. Any signal transmitted at an angle

less than A_m will also be refracted back to Earth. However, transmitting at an angle greater than A_m will result in the signal passing through the Ionosphere and being lost to outer space. Figures 3, 4, and 5 show curves for the maximum usable angle at noon time critical frequencies of F_o = 5 MHz (lowest curve), F_o = 7 MHz, F_o = 9 MHz, F_o = 11 MHz, and F_o= 13 MHz (highest curve), for the 40, 20, and 15 meter bands respectively.

Figure 3 clearly shows that 40 meters is an excellent regional communications band in that it supports high transmission angles a good portion of the time. Potentially 40 meters is also a good DX band since it also supports low angle transmissions (transmissions at all angles less than the maximum usable angles shown in the chart). However, during day light hours the Ionosphere D Layer absorbs low angle 40 meter signals minimizing 40 meter day time DX opportunities. At night, when the D Layer disappears, 40 metes becomes a reasonably good DX band.

20 meters is a marginal regional communications band in that it supports high transmission angles only during mid day and then only during high sunspot activity. However, 20 meters is an excellent DX band supporting transmission angles below 25 degrees during the day throughout a good portion of the 11 year solar cycle (the top 3 curves), and even at night during high sunspot activity. Note that day time D Layer absorption is much less of a problem on 20 meters since the amount of absorption is proportional to $1/(F_b)^2$. Thus the D Layer absorption on 20 meters is only 1/4 of that on 40 meters, permitting good day time DX opportunities on 20 meters.

15 meters is strictly a DX band supporting only low angle transmissions and then only during daylight hours.

There is nothing new in these results. However, it is reassuring to see that the theory matches what we operationally experienced.

The charts do provide some interesting insight that otherwise might not be apparent. As the critical frequency F_o decreases at night, and as the noon time value of F_o decreases with decreasing solar sunspot activity, those amateur radio operators with low angle radiating antennas (tall vertical antennas, high dipoles, or high yagis) will likely experience more hours of successful communications per day than those using antennas with higher transmission angles. For example, when the noon time critical frequency F_o = 9 MHz, those with antennas radiating at 30 degrees can communicate on 20 meters from approximately 0900 in the morning to about 1800 hours in the afternoon. Under the same conditions, operators using antennas radiating at 15 degrees can communicate well into the evening. In general, on 20 metes and above, as the noon time critical frequency decreases, the number of hours per day available for communications also decreases. In addition, the center of the daily communications window is generally about 1300 hours.

This information provides at least a partial answer to the question of how high an antenna should be. The charts indicate that the longest hours of operation on 20 meters and above is achieved with antennas radiating at an angle less than 20o. To achieve a transmission angle less than 20o, Table 1 shows that a horizontal antenna (dipole or yagi) must be at least 3/4 wavelength above ground. At 20 meters this requirement mandates that the antenna be 52 feet above ground. A multiband yagi installed at this height will be approximately one wavelength above ground when operated at 15 meters, producing a transmission angle on this band of approximately 15o. At 10 meters the transmission angle will be slightly less. Thus 50 to 55 feet is a fairly good height for a multiband yagi. Raising the antenna to 70 feet will place it one wavelength above ground on 20 meters, decreasing the transmission angle on that band by about 6 degrees (from 21 degrees to about 15 degrees).

Regional communications requires high transmission angles in the range from approximately 40 to 90 degrees. The charts indicate that 80 and 40 meters support communications at these high angles a good percentage of the time. Table 1 above shows that 80 and 40 meter antennas must be installed at about 1/8 to 1/4 wavelength above ground to achieve the desired high transmission angles. Installing a pair of 80 and 40 meter Inverted V antennas on a 32 foot tall center pole (1/8 wavelength high on 80 meters and 1/4 wavelength up on 40) achieves the desired results producing an excellent set of regional communication antennas. A 20 meter Inverted V antenna also installed on the pole at 32 feet will be 1/2 wavelength above ground and produce a transmission angle of approximately 30 degrees. Consulting the charts, this 20 meter antenna will provide fairly operation during day light hours, but not as good as high dipoles or vertical antennas at night or during periods of low sunspot activity (low noon time F_o values) .

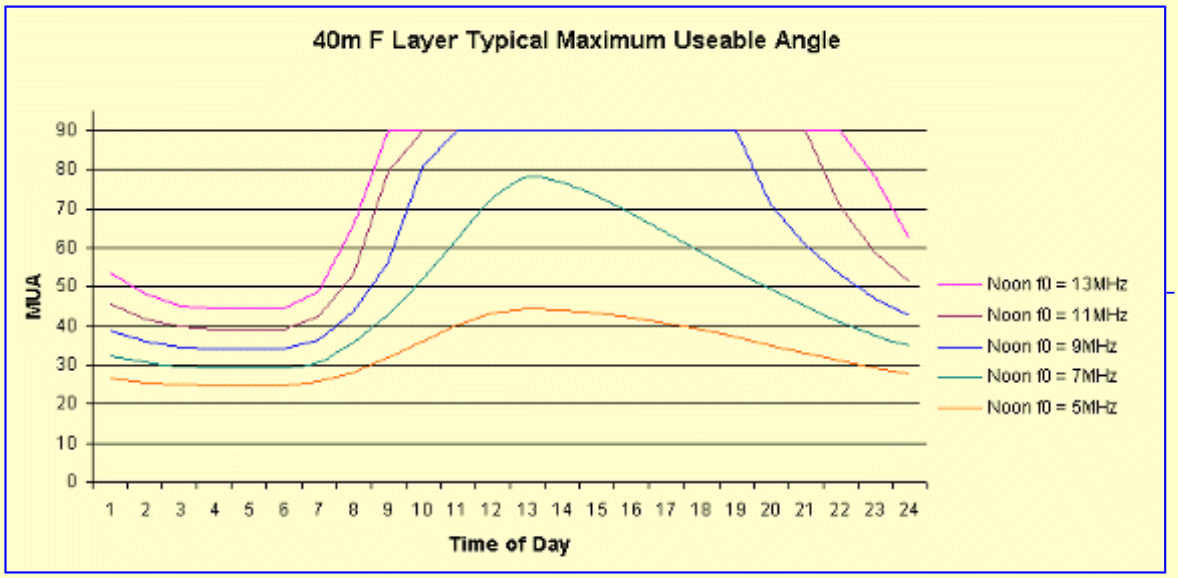

Figure 3

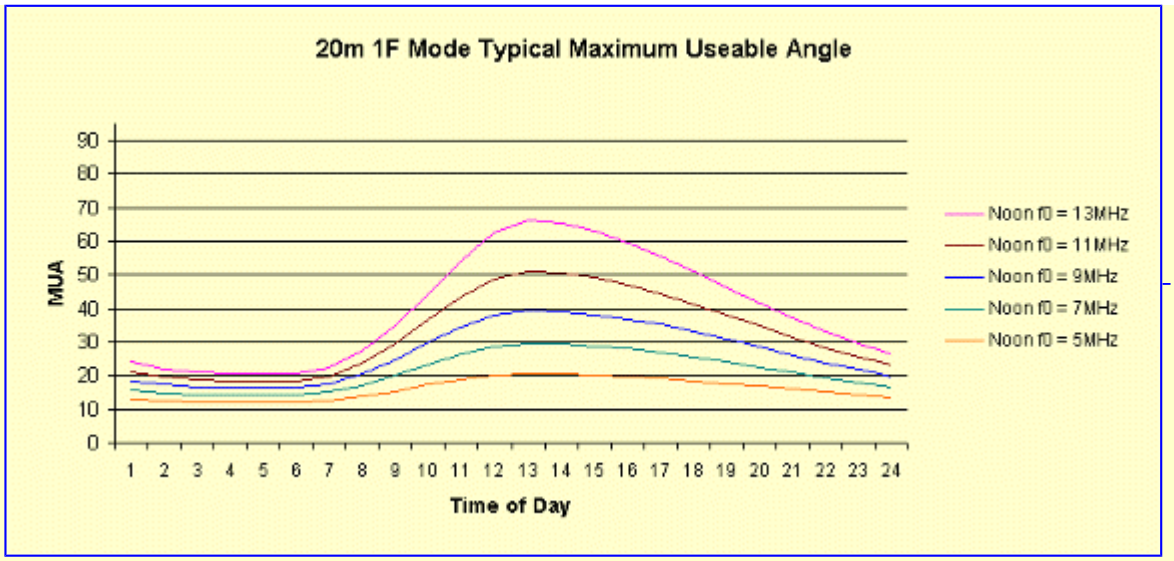

Figure 4

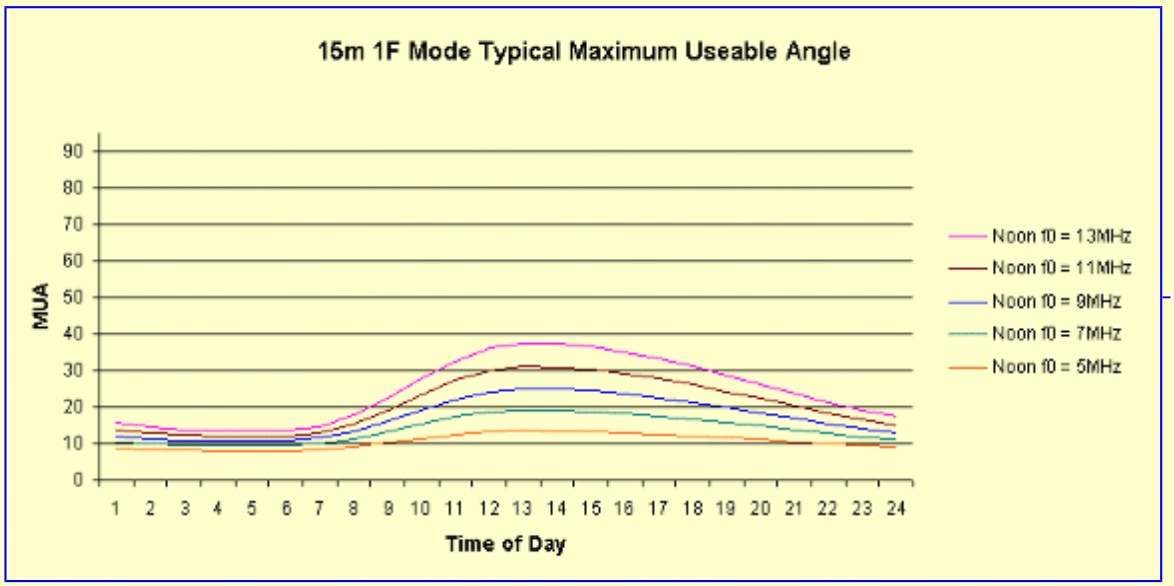

Figure 5

Event Calendar 2004

Date	Event	Comments
Jan. 8	**CVARC Meeting**	**General CVARC Meeting**
Jan. 11	**So. Cal. Orienteering**	**In Griffith Park near Travel Town Arrive 9:30 AM**
Jan. 13	**CVARC Radio Class**	**New class for Amateur Technician Lic.**
Feb. 8	FCC License Exam	Begins at 8:30AM at East County Sheriff Station
Feb. 12	CVARC Club Meeting	General Club Meeting
Feb. 20-23	Coyote 4 Play	3 day Cross Country Race in Ojai "&" Santa Monica Mts.
Mar. 6	CLU MS Walk	CROP Walk Tentative Date
Mar. 11	CVARC Meeting	General Club Meeting
Mar 13	Westlake Street Fair	Tentative Date
April 3	Simi Valley MS Walk	Tentative Date Volunteers Welcome
April 8	CVARC Meeting	General Meeting
April 11	FCC License Exam	Begins at 8:30AM at East County Sheriff Station
Apr 24-25	Baker to Vegas Run	Supporting Ventura County Sheriff Dept.
May 8	Cruisin Conejo Bike Ride	Tentative Date CVARC supports Conejo Valley Cyclist
May 13	CVARC Meeting	Club Meeting
May 15	Sea To Summit Bike Ride	Tentative Date Ventura ARES/RACES event
June 3	CVARC Class	Amateur Radio Technican License class begins
June 10	CVARC Meeting	General Meeting

June 13	FCC License Exam	License exams given at sheriff station
June 26-27	Field Day	CVARC annual field day event, don't miss it!
July 3	Moorpark Fireworks	Comm. support for Moorpark's 4th of July Fireworks

Radio Amateur Civil Emergency Service

Ventura County Area 2 R.A.C.E.S. members are encouraged to check in every Tuesday night at 7:00 pm on the Area 2 Check-in Net. Specific ARES/RACES times and frequencies are as follows:

ARES/RACES Times And Frequencies

Area	Time	Mode	Frequency	Pl	Repeater
County	7:30-8 pm	Voice	146.880 -	127.3	WA6ZTT
County	7:30-8 pm	Voice	224.020 -	127.3	WB6ZTR
County	Before 6:30 pm	Packet	145.710	No pl	Hospital Net
County	RACES Simplex	Voice	147.570	No pl	____
Area 1	7:00-7:30 pm	Voice	147.930 -	127.3	WB6WEY
Area 2	**7:00-7:30 pm**	**Voice**	**147.885 -**	**127.3**	**N6JMI**
Area 2	**Simplex**	**Voice**	**147.555**	**No pl**	**___**
Area 2	**Backup Repeater**	**Voice**	**146.850 -**	**94.8**	**K6AER**
Area 2	**Amgen Repeater**	**Voice**	**449.440 -**	**131.8**	**KE6SWS**
Area 3	7:15-7:30 pm	Voice	147.150 +	127.3	WB6ZTQ
Area 4	7:15-7:30 pm	Voice	146.970 -	127.3	WB6YQN
Area 5	7:00-7:30 pm	Voice	145.400 -	No pl	N6FL
Area 6	7:00-7:30 pm	Voice	147.975 -	127.3	N6AHI

Area 7	7:00-7:30 pm	Voice	146.985 -	127.3	WB6ZTX
Area 8	7:00-7:30 pm	Voice	145.280 -	100	WB2WIK
6 Meter	6:45-7:00 pm	Voice	052.980 -	082.5	K6SMR

The Net Controller ✗ s script for the Area 2 weekly RACES check-in net is on the CVARC website, in printable form. Every member is encouraged to periodically serve as net controller. RACES members should remember that their RACES card is issued for only two years. When your card is due to expire call Jackie at the Office of Emergency Services in Ventura for an appointment to renew your card. Call (805) 654-2551 or toll free from the east half of the county at (800) 660-5474. For packet, call coordinator Dan Dicke KE6NYT (805) 983-1401. To register for Red Cross Disaster Services Classes, call (805) 339-2234 ext 0 Ventura County ARES/RACES web site: http://home1.gte.net/res19999/

2004 CVARC OFFICERS

President	Rory Eikland	KG6HCU	(805)493-4949	cim@earthlink.net
Vice President	Rob Hansen	W6RH	(805)376-9350	w6rh@aol.com
Secretary	Noel Van Slyke	K6NVS	(805)482-3744	vanslyke@vcnet.com
Treasurer	Mike Pershing	KD6IJF	(805)493-1934	mpershing@earthlink.net
Editor/Publisher	Ken Larson	KJ6RZ	(805)495-9435	kj6rz@highstream.net
Operations	OPEN	___	___	___
Education	Karl Moody	KE6WVZ	(805)523-0622	Karlsharon@aol.com
Public Relations	Jeff Reinhardt	AA6JR	(818)706-3853	aa6jr@arrl.net
Technical	Hugh Bosma	KF6WVZ	(805)498-1987	hrbcrb@aol.com
Social	OPEN	___	___	___
Member-at-Large	Alan Masson	K6PSP	(805) 498-9920	K6PSP@arrl.net
Member-at-Large	Neil Waybright	KG6QEL	___	___

ARRL

ARRL Southwestern Division Director:	Art Goddard, W6XD, 2901 Palau Pl., Costa Mesa, CA 92626	(714)556-4396 w6xd@arrl.org
ARRL Southwestern Division Vice Director:	Tuck Miller, NZ6T, 3122 E. 2nd St., National City, CA 91950	(619)434-4211 nz6t@arrl.org
ARRL Santa Barbara Section Manager:	Robert Griffin, K6YR, 1436 Johnson Ave., San Luis Obispo, CA 93401	(805)543-3346) k6yr@arrl.org
ARRL VUCC (VHF/UHF Century Club) Certification:	Peter Heins, N6ZE	(805)496-1315 n6ze@aol.com

The Conejo Valley Amateur Radio Club is an ARRL affiliated Special Service Club. Meetings are held on the second Thursday of each month, unless otherwise noted. Meeting location is at the Elks Lodge, 158 Conejo School Rd., Thousand Oaks, CA. Meetings start at 7:30 pm. with a pre-meeting social and technical assistance session, for those who are interested at 7:15 pm. Meetings are open to the public, and members are encouraged to bring their friends.

Return to CVARC

Editors: Ken and Paula Larson