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**OCRACES
Holiday Dinner**

**Marie Callender's
in Orange**

**Monday,
December 4, 2023
at 6:30 p.m.**



Newsletter of the County of Orange Radio Amateur Civil Emergency Service

CRO's Nest

by Ken Bourne, W6HK, OCRACES Chief Radio Officer

Quarter-Wave Stubs

Transmission lines exhibit impedance-transformation properties. The input of a line that is less than a quarter wavelength appears as an inductive reactance if the end of the line is shorted, and as a capacitive reactance if the line is open. If longer than a quarter wavelength, the open stub becomes an inductive reactance. Such lines, used as stubs, can function as low-loss inductors or capacitors in matching networks. A special kind of stub is a quarter-wave stub. When it is short-circuited at its load end, it is an open circuit at its input. If it's an open circuit at its load end, it presents a short circuit at its input. That's because it inverts the impedance of a short or an open-circuit at the frequency for which the line is a quarter wavelength long. This condition holds true for frequencies that are odd multiples of the quarter-wave frequency. However, the short or open at the load end of a half wavelength of line (or integer multiples thereof) is the same at the input.

This is explained by a 180-degree

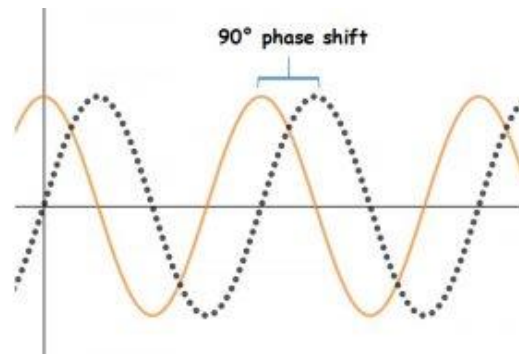


Figure 1. 90-degree phase shift.

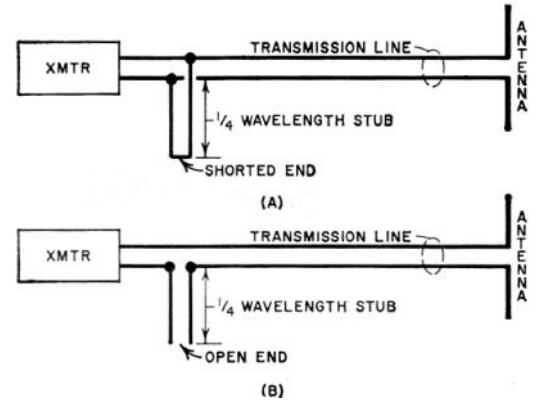


Figure 2. Shorted-end quarter-wave stub filter (A) and open-end stub (B). Both types eliminate even-order harmonics. (These drawings appeared in a 1960 edition of *Popular Electronics* magazine.)

phase shift at the end of the shorted stub and a 0-degree phase shift at the end of the open stub.

To understand how this works, envision a radio signal as a sine wave, and what happens if a sine wave is shifted by 90 degrees (Figure 1). A phase shift of 180 degrees is a phase cancelation. A phase shift of 360 degrees is the same as no phase shift at all—shifting a sine wave by a full wavelength gives the same wave back again.

There is a total of 360 degrees (i.e., 90 degrees + 180 degrees + 90 degrees = 360 degrees, equivalent to 0 degrees) with the shorted quarter-wave stub, so it has no effect where it attaches to the main transmission line. The open stub has no phase shift at the open end, so there is a 180-degree

(Continued on page 2)

CRO's Nest *Continued from page 1*

phase shift (90 degrees + 0 degrees + 90 degrees = 180 degrees) at the attachment point to the main transmission line. Quarter-wave stubs are useful as “traps” or filters to attenuate even-order harmonics from transmission lines.

An open stub that is equal in length to one-quarter of the wavelength (accounting for the cable’s velocity factor) of an interfering signal will effectively short out that interfering signal, but not affect the desired signal.

You can eliminate harmonics from your transmitter with easy-to-make tuned stubs. Quarter-wave stub filters effectively eliminate even-order harmonics (2nd, 4th, 6th, etc.) from the output of a transmitter feeding a single-band antenna. The shorted quarter-wave stub in Figure 2 (A) is connected in parallel with the open-wire or coaxial transmission line from the transmitter to the antenna. This shorted stub appears as a low-impedance short circuit only at the unwanted even-order harmonic frequencies but has a very high impedance to the fundamental transmitted signal. This signal passes on to the antenna with virtually no loss in transmitted power.

The open-end quarter-wave stub in Figure 2 (B) is connected in series with the open-wire transmission line (not suitable for coaxial lines). This stub has virtually no resistance to the fundamental frequency, but since it appears as some multiple of a half wavelength at even harmonics, it presents a near-infinite impedance and prevents even harmonics from passing to the antenna. It is also useful as a notch filter.

To construct a stub filter for your transmitter, use the same type of transmission line that connects your radio to your antenna. To determine its length in feet, divide 246 by the transmit frequency in megahertz and multiply the result by the velocity factor of the stub transmission line. If you use RG-213, RG-8, or RG-58 coaxial cable, the velocity factor is 0.66.

A shorted quarter-wave stub made of high-quality coax (such as RG-213) and connected directly at the output of the transmitter will typically provide 20 to 25 dB attenuation of the second harmonic. However, different manufacturing runs of high-quality coax will exhibit variations in velocity factor. It should originally be cut slightly longer than the calculated quarter wavelength and then trimmed in short pieces while monitoring on an antenna analyzer the response at the fundamental frequency. While trimming, the stub is open at the load end and shows a short at the fundamental frequency (which you don’t want during operation!). Once the stub is tuned to frequency, solder a jumper between the coax center conductor and shield at the load end. Then measure the response at the second harmonic.

Modern transceivers have excellent (but not perfect)

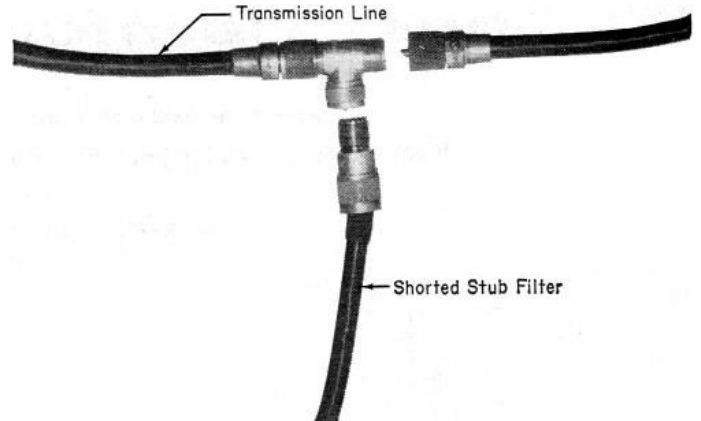


Figure 3. A shorted-stub filter connected to a coaxial transmission line by means of an inserted T-connector.

attenuation of spurious and harmonic radiation. If a station is operating on 20 meters in the vicinity of a 40-meter station, such as at an OCRACES Field Day, the very low second-harmonic radiation of the 40-meter station will still be enough to interfere with the nearby 20-meter station. A nearby 10-meter station will be subject to fourth-harmonic radiation from the 40-meter station and second-harmonic radiation from the 20-meter station. Such interference can be eliminated by a shorted quarter-wave stub in parallel with the 40-meter and 20-meter transmitter output terminals. If, for example, the shorted quarter-wave stub is placed in parallel with the 40-meter station’s transmission line, at twice a fundamental frequency of 7.1 MHz that same stub is now a half-half wave at 14.2 MHz on 20 meters (second harmonic) and a full wave at 28.4 MHz on 10 meters (fourth harmonic). The quarter-wave stub acts as a trap for even-order harmonics.

If you cause interference to receiving an FM broadcast station on 104.3 MHz when you are transmitting on the input (52.12 MHz) of the OCRACES 6-meter repeater, you can easily build a stub filter to attenuate the second harmonic of 104.24 MHz. Using a T-connector in line with your coaxial cable, determine the length of a shorted stub by dividing 246 by 52.12 MHz, which equals 4.72 feet. Multiply that by 0.66 if you are using RG-58/U or similar cable with that velocity factor, and the length of your shorted stub would be 3.115 feet or 37.38 inches.

Shorted quarter-wave stubs are also effective lightning arrestors. They do not affect operations on their calculated frequency, but they short out surges from nearby lightning strikes or electromagnetic pulses (EMP). They are commercially available for microwave frequencies, such as in AREDN mesh networks. For example, PolyPhaser offers repetitive-strike surge protectors that suppress a DC surge while featuring a passband at the required frequency range. ★

OCRACES Holiday Dinner: December 4, 2023

OCRACES members will gather for their annual Holiday Dinner on Monday, December 4, 2023, at 6:30 p.m. (an hour earlier than our regular monthly meetings) at Marie Callender's Restaurant & Bakery, 307 E. Katella Avenue, in Orange. There will be no net or regular meeting that evening. ★

Take Precautions Against Thieves

When returning home from an event such as a RACES meeting or activation, you don't want to discover your amateur radio equipment and other precious possessions have been stolen. Here is a list of things to do to keep your home safe from thieves, as provided by a home security company to a reader (John and Connie H., in Massachusetts) of the "Hints from Heloise" column in the *Orange County Register* (November 27, 2023, edition):

1. Install window locks if you don't already have locks on your windows.
2. For sliding doors, grab a wooden or metal rod and place it in the track of the door to stop a potential forced entry.
3. Do not let shrubbery grow over your windows. Keep them trimmed back so that no one can hide in them.
4. Never open doors to strangers. Look through the peephole before opening doors to anyone.
5. Never broadcast your vacation plans on social media. Wait until you get back from your trip; then you can post photos and talk about what a great time you had.
6. Video doorbells are an excellent way to monitor who's on your doorstep.
7. Motion-detecting outdoor lights will usually deter a thief, especially if you have an outdoor camera that records footage of the intruders. Use high-resolution cameras that also have night vision.
8. If you have a house key hidden outside of your home, try putting

it in a plastic bag and burrowing it in a potted plant, a window box, or in some other unusual spot. Don't tell anyone where it is.

9. People tend to overlook gate locks and garage locks. Just remember, thieves want a quick and easy way into your home. Make it as hard for them as you can.

Regarding social media (such as Facebook), as mentioned in item 5, not only should you not mention vacation plans, but you should not even mention a RACES or other meeting you plan to attend. That only alerts the potential thieves that you won't be home at that time. If you are a PSR, don't mention any meetings at the Sheriff's Academy. In fact, don't even mention you are affiliated with any government agency. You don't want to be a target! ★

What to Take When Evacuating by Vehicle

OCRACES is ready to provide communications assistance during evacuations. But what if RACES members themselves need to be evacuated? Several survivalist groups recommend to take the following items when evacuating by vehicle, according to "Noah R." in Great Falls Montana, who contributed this list to the "Hints from Heloise" column that appeared in the November 24, 2023, edition of the *Orange County Register*:

- Cellphone and extra batteries for the phone
- Battery-powered or hand-cranked radio
- Headlamp with extra batteries
- Multipurpose wrench for turning off (or on) gas and water
- Cash in small bills
- Solar charger
- Swiss Army Knife
- Whistle
- Two flashlights with extra batteries
- First-aid kit and any medication you are currently taking
- Three-to-five-day supply of water and food
- Sleeping bags and a reflective blanket
- Four to five cigarette lighters (if you have extra, you can barter with others for things you need)
- All important documents (birth certificates, passports, deeds, etc.)
- Dust masks
- Toilet paper, disinfecting wipers, bleach, toothpaste with brushes, and a can opener
- Rolling plastic storage tub with heavy-duty wheels to put everything inside
- Seasonal clothing
- Your pets, along with their food and water

"Noah R." says, "You never know when a disaster will strike. It's better to be ready to leave than to be stuck somewhere without help, food, or water." ★

2023 SKYWARN Recognition Day: December 2

The popular annual SKYWARN™ Recognition Day (SRD) will be held on December 2, 2023, from 0000Z to 2400Z. SRD was developed in 1999 by the National Weather Service and ARRL. It celebrates the contributions that volunteer SKYWARN radio operators make to the National Weather Service. During the day, SKYWARN operators visit NWS offices and contact other radio operators across the world.

SKYWARN Recognition Day Operating Instructions

1. Object: For all amateur stations to exchange QSO information with as many Amateur Radio SKYWARN Spotters and National Weather Service Stations as possible on the 80, 40, 20, 15, 10, 6, and 2-meter and 70-centimeter bands. Contacts via repeaters are permitted. SKYWARN Recognition Day serves to celebrate the contributions to public safety made by amateur radio operators during severe weather events of the past year.
2. Date: NWS stations will operate December 2, 2023, from 0000 to 2400 UTC.
3. Exchange: Call sign, name, location, signal report, a one- or two-word description of the weather occurring at your site ("sunny," "partly cloudy," "windy," etc.), temperature reading if available and SRD Number if the station has one.
4. Modes: NWS stations will work various modes including SSB, FM, AM, RTTY, Winlink, CW, FT8, FT4, and PSK31. While working digital modes, special event stations will append "/NWS" to their call sign (e.g., N0A/NWS).
5. Station Control Operator: It is suggested that during

SRD operations for NWS offices a non-NWS volunteer should serve as a control operator for your station.

6. Event and QSL Information: The National Weather Service will provide event information via the [SRD website](#). Event certificates will once again be electronic and printable from the main website after the conclusion of SRD.
7. Log Submission: To submit your log summary for SRD, you can use the online submission form that will be made available on the NWS SRD Recognition main page when the event is completed. Deadline for log submission is January 31, 2024.

Note on NWS Station Operations: For 2023, guidance on in-person amateur radio operations by volunteers will be determined by each National Weather Service Local Forecast Office. Amateur radio operators must make all necessary inquiries ahead of SRD with the appropriate NWS staff at your respective Weather Forecast Office before registering the NWS office for this event.

Involving Non-Amateur Radio SKYWARN Spotters in SRD

Amateur Radio SKYWARN groups and those groups involved with their NWS amateur radio office station setups are encouraged to actively reach out and find ways for non-amateur radio SKYWARN spotters to participate in the event. This can be done through social media and other ways in coordination with the local NWS offices.

For more information on SRD: [NWS SKYWARN Recognition Day Main Page](#)

For More Information on SKYWARN: [NWS SKYWARN](#)

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West Mountain Offers Battery Analyzer

You can scientifically analyze battery performance with the [West Mountain CBA V computerized battery analyzer](#). It provides true constant current battery capacity test with results graphically displayed. Discharge current is software and electronically regulated using a solid-state switch and fan-cooled electronic load. It tests any type of battery—coin cell to automotive or larger—with presets for NiCad, NiMH, lead acid, lithium-ion, lithium-polymer, alkaline, carbon zinc, mercury, etc. It has solar cell profiling capability. Lower current testing capabilities are down to 10 mA. Multiple discharge tests can use watts as a parameter (with Extended Software upgrade). It is available from HRO and Powerwerx.

The CBA V tests quickly at real-world load conditions, up to 150 watts or 40 amperes maximum, whichever

is higher. It provides high-voltage testing at up to 48 volts (55 volts in Pro version), the equivalent of 1 to 38 NiCad or NiMH cells. It performs a power profile test (increase current at user's rate to see how voltage/power responds), which is useful for testing maximum power output of a power supply or solar cell. An on-board computer performs accurate measurement with 12-bit effective resolution. Auto ranging is provided for two current ranges and three voltages. ★



West Mountain CBA V computerized battery analyzer.

Elecraft Offers Hand-Held, 5-Band CW Radio

Elecraft has introduced the pocket-sized KH1 hand-held, 5-band CW transceiver, with a form factor optimized for both desktop and pedestrian mobile use. It covers the 40-15 meter ham bands on transmit and 6-22 MHz receive. It produces 5 watts CW on all bands, with CW decode and 32K TX log. See <https://elecraft.com/products/kh1-transceiver> for specs.

Features include scan/mini-pan, real-time clock, full remote control, and speaker. It has RIT, XIT, and VFO lock.

The KHATU1 antenna tuning unit (ATU) includes a whip and high-Q inductor for 20/17/15 meters.

It includes a 2.5-AH Li-ion battery and internal charger. The light gray case stays cool even in bright sunlight. ★



KH1 with attached KHLOG1 log tray, KHPD1 keyer paddle, and telescoping whip with KHATU1 ATU. The log tray mounts on the left or right side. It stays open with detent; folds closed to protect the front panel. The whip retracts to 6 inches and extends to 45 inches. It clips to the side of the radio for transport.

FCC Removes Symbol Rate Restrictions

As predicted in the November 2023 issue of *NetControl*, the FCC Commissioners unanimously voted on to amend the Amateur Radio Service rules to replace the baud rate limit on the Amateur HF bands with a 2.8-kHz bandwidth limit to permit greater flexibility in data communications.

“The Federal Communications Commission today adopted new rules to incentivize innovation and experimentation in the amateur radio bands by removing outdated restrictions and providing licensees with the flexibility to use modern digital emissions,” announced the FCC.

“Specifically, we remove limitations on the symbol rate (also known as baud rate)—the rate at which the carrier waveform amplitude, frequency, and/or phase is varied to transmit information—applicable to data emissions in certain amateur bands,” concluded the [FCC Report and Order and Further Notice of Proposed Rulemaking](#), adopted November 13, 2023. “The amateur radio community can play a vital role in emergency response communications, but is often unnecessarily hindered by the baud rate limitations in the rules.”

Consistent with ARRL’s request, the amended rules will replace the current HF restrictions with a 2.8-kHz bandwidth limit. “We agree with ARRL that a 2.8-kilohertz bandwidth limitation will allow for additional emissions currently prohibited under the baud-rate limitations while providing sufficient protections in the shared RTTY/data subbands,” concluded the FCC Report and Order.

ARRL President Rick Roderick, K5UR, hailed the FCC’s action to remove the symbol rate restrictions. Roderick stated that “this action will measurably facilitate the

public service communications that amateurs step up to provide, especially at times of natural disasters and other emergencies such as during the hurricane season. Digital technology continues to evolve, and removing the outmoded data restrictions restores the incentive for radio amateurs to continue to experiment and develop more spectrum-efficient protocols and methods while the 2.8 kHz bandwidth limit will help protect the shared nature of our bands. We thank Congresswoman [Debbie] Lesko (AZ-08) for her efforts on behalf of all Amateurs to get these restrictions removed.”

In a Further Notice of Proposed Rulemaking (FNPRM), the FCC proposes to eliminate similar restrictions where they apply in other bands. “We propose to remove the baud rate limitation in the 2200 meter band and 630 meter band ... and in the very high frequency (VHF) bands and the ultra-high frequency (UHF) bands. Additionally, we seek comment on the appropriate bandwidth limitation for the 2200 meter band, the 630 meter band, and the VHF/UHF bands.” ARRL has previously expressed its support for eliminating the symbol rate limits in favor of bandwidth limits where they apply on the VHF and UHF bands but suggested that the bandwidth limits themselves be reviewed in light of today’s technology and tomorrow’s possibilities. Similarly, when eliminating the baud limits on the 2200 and 630-meter bands, consideration should be given to what, if any, bandwidth limits are appropriate.

The FCC will announce a period for public comment on the additional proposed changes based upon publication of the FNPRM in the *Federal Register*.

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Countywide RACES/EmComm News

“RACES/EmComm News” provides an opportunity to share information from all City & County RACES/ACS units and EmComm organizations and supportive amateur radio clubs in and near Orange County, as well as from Cal OES and federal agencies.

Please send your news to NetControl Editor Ken Bourne, W6HK, at:

kbourne.ocsd@earthlink.net



Brea RACES

Cliff Riddlebarger, K6UDW, Silent Key

We are very sad to report that Brea RACES member Cliff Riddlebarger, K6UDW, passed away on October 4, 2023. He was active in Brea RACES and CERT since Fall 2016. He was also active in the Orange County RACES drills. He would work remote and would do the check-in for Brea on the 60-meter portion of the drill. Cliff had a General Class license. He was always ready to help out. He was looking forward to the October 7th City/County RACES & EmComm ACS Drill when he died suddenly just three days earlier. Cliff is survived by his wife, Mary Lou.

Countywide Winlink P2P Exercise

Based on the very successful previous exercises, Scott MacGillivray, KM6RTE, advises that the next countywide Winlink Peer-to-Peer (P2P) practice exercise is planned for the morning of Saturday, December 9, 2023. This exercise continues to expand on the various ways Winlink P2P can be utilized, as well as helps gain experience using Winlink P2P communication mode.

The exercise will again focus on sending a Winlink P2P message with an attached form to “Drill Ops” located at Loma Ridge. This location characterizes the coordinating AuxComm station for the county. Details are fully described in the instructions currently being finalized and will be distributed several days prior to the exercise.

It is important to note that this is an informal practice exercise (organized by Scott) and not associated with any organization. Your participation is solely for your own personal benefit, and the exercise is not to conflict with any official city or county government activities.

Importance of Winlink P2P

For those not familiar with Winlink P2P, it is one of the four Operating Modes that Winlink supports and does not rely on intermediate “Gateways” or connection to the internet. It is extremely valuable to understand how to operate this mode since it is expected to be the primary Winlink mode

operational after a major disaster when phone, text, and internet services are not available in the surrounding region. Scott highly recommends that you take advantage of this drill if you have not operated P2P before. Though, make sure your Winlink equipment can operate using Conventional Mode (i.e., using local RMS “Gateway”) before participating in this drill. The purpose of this drill is not to verify that your Winlink equipment works, but instead focuses on becoming familiar with how to operate P2P mode.

If you have questions or comments, contact Scott at esmacg67@outlook.com.

Earthquake Country Alliance (ECA)

The ECA SoCal Fall 2023 Online Workshop will be held on Tuesday, December 5, 2023, at 1-3 p.m. Join the workshop to debrief this year’s ShakeOut, learn how to know locations of nearby faults and other hazards, hear updates from ECA SoCal 2023 Mini Award recipients (and information about the 2024 program), and to plan for the Northridge Earthquake 30th anniversary (featuring Quake Heroes Expos). Participants will also be able to share their upcoming activities, new resources, etc., and connect with colleagues from around Southern California.

REGISTER TO PARTICIPATE

Amateur Radio License Exam Session

CNARN (California Nevada Arizona Repeater Network) is offering an amateur radio license exam session on Sunday, December 10, 2023, at 8:00 a.m. at Boissenc Park, 7520 Dale St., in Buena Park. Walk-ins are allowed. For further information, contact Emilio M. Sison, W6EMS, at (714) 322-1322 or w6ems.us@gmail.com. This is an ARRL/VEC. The CNARN website is <https://cnarn.net/>.

December 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2 Weekly 60 m ACS Net & SKYWARN Recognition
3	4 OCRACES Holiday Dinner (no net)	5	6	7	8	9 Weekly 60 m ACS Net
10	11 Weekly 2 m ACS Net	12	13	14	15	16 Weekly 60 m ACS Net
17	18 Weekly 2 m ACS Net	19	20	21	22	23 Weekly 60 m ACS Net
24	25 Christmas Day (no net)	26	27	28	29	30 Weekly 60 m ACS Net
31						

Upcoming Events:

- **December 2, 0000-2400 UTC:** SKYWARN Recognition Day
- **December 4, 1830 hours:** OCRACES Holiday Dinner, Marie Callender's Restaurant & Bakery, 307 E, Katella Avenue, Orange
- **December 25: Christmas Day** (no net, no regular meeting)



<https://ocraces.org>

Mission Statement

County of Orange RACES has made a commitment to provide all Public Safety departments in Orange County with the most efficient response possible to supplement emergency/disaster and routine Public Safety communications events and activities. We will provide the highest level of service using Amateur and Public Safety radio resources coupled with technology, teamwork, safety, and excellence. We will do so in an efficient, professional, and courteous manner, accepting accountability for all actions. We dedicate ourselves to working in partnership with the Public Safety community to professionally excel in the ability to provide emergency communications resources and services.

County of Orange RACES Frequencies

- 60 m: 5371.5 kHz USB (dial) (Channel 4) (OC ACS Net—Saturdays, 1000 hours)
- 40 m: 7250 kHz LSB
- 10 m: 29.640 MHz output, 29.540 MHz input, 107.2 Hz PL (down for repair)
- 6 m: 52.620 MHz output, 52.120 MHz input, 103.5 Hz PL
- 2 m: 146.895 MHz output, 146.295 MHz input, 136.5 Hz PL*
- 2 m: 146.595 MHz simplex
- 1.25 m: 223.760 MHz output, 222.160 MHz input, 110.9 Hz PL
- 70 cm: 446.000 MHz simplex
- 70 cm: 448.320 MHz output, 443.320 MHz input, 141.3 Hz PL (private)
- 70 cm: 449.100 MHz output, 444.100 MHz input, 110.9 Hz PL (private)
- 70 cm: 449.180 MHz output, 444.180 MHz input, 107.2 Hz PL (private)
- 70 cm: 449.680 MHz output, 444.680 MHz input, 131.8 Hz PL (private)
- *Primary Net—Mondays, 1900 hours

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Visit Our Web Site
<https://ocraces.org>
It's Where It's @!

Questions or Comments?
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**“W6ACS ...
 Serving
 Orange County”**

Meet Your County of Orange RACES Members!

Officers →



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Scott Byington KC6MMF
Randy Benicky N6PRL
Ernest Fierheller KG6LXT

**OCSD
 RACES** →
Coordinator



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Scott MacGillivray KM6RTE



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