



Newsletter of the County of Orange Radio Amateur Civil Emergency Service

CRO's Nest

by Ken Bourne, W6HK, OCRACES Chief Radio Officer

Collinear Antenna Design

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OCRACES Meeting

Monday, September 9th, at 7:30 p.m., on Zoom

Planning for the October 5th City/County Drill

Collinear antennas are high-gain omnidirectional antennas commonly consisting of two or more dipole antennas vertically stacked in such a way that their corresponding elements are parallel and collinear with each other. Other configurations may consist of vertically stacked vertical Yagi beam antennas, or a horizontal antenna made of sections of coaxial cable. The design of collinear arrays is based on in-phase feeding of radiating elements that are lined up serial and their radiation is typically omnidirectional perpendicular to the longitudinal axis of elements.

Before I go further, I'll define *collinear*, so you don't confuse it with *colinear*. Merriam-Webster defines the adjective *colinear* as "lying on or passing through the same straight line" or "having axes lying end to end in a straight line." On the other hand, while *colinear* can mean *collinear*, Merriam-Webster defines *colinear* as "having corresponding parts arranged in the same linear order." So what is a linear order (or an order that is linear)? At the risk of getting overly complex about *linear*, when all I want to do is share some interesting information about collinear antennas, I'll quickly mention that one of many definitions of the adjective *linear* is "of, relating to, resembling, or having a graph that is a line and especially a straight line." Another definition of *linear*, which relates to linear amplifiers that hams commonly use, is "having or being a response or output that is directly proportional to the in-

put." In other words, linear amplifiers have nothing to do with collinear antennas!

Typical collinear antennas, especially those for rugged land-mobile base stations, consist of stacked dipoles or folded dipoles. Vertical half-wave dipoles and quarter-wavelength monopoles have an omnidirectional radiation pattern in free space. With vertical polarization, they radiate equally in all azimuthal (horizontal) directions perpendicular to the antenna, with decreasing radiation on the antenna vertical axis. Stacking several of these antennas in a vertical collinear array results in increased radiation (gain) in horizontal directions and reduced radiation toward the sky or down toward the earth, where the signal would be wasted. With a diminishing return, the more segments you have, especially beyond eight, the less benefit there is to add more. Increasing segments also narrows the bandwidth. The more segments, the more precisely you need to measure and to maintain equality in dimensions. Also, the more segments, the flatter the pattern, which decreases pickup of signals at higher angles.

You would think that doubling the number of stacked antennas in a collinear fashion would double the gain of the array, or 3 dB. However, the gain is not quite that much, due to the antennas not being perfectly lossless and the radiation pattern not being perfect.

In addition to stacking half-wave dipoles or phased quarter-wave antennas (which is a challenge in achieving perfect

CRO's Nest *Continued from page 1*

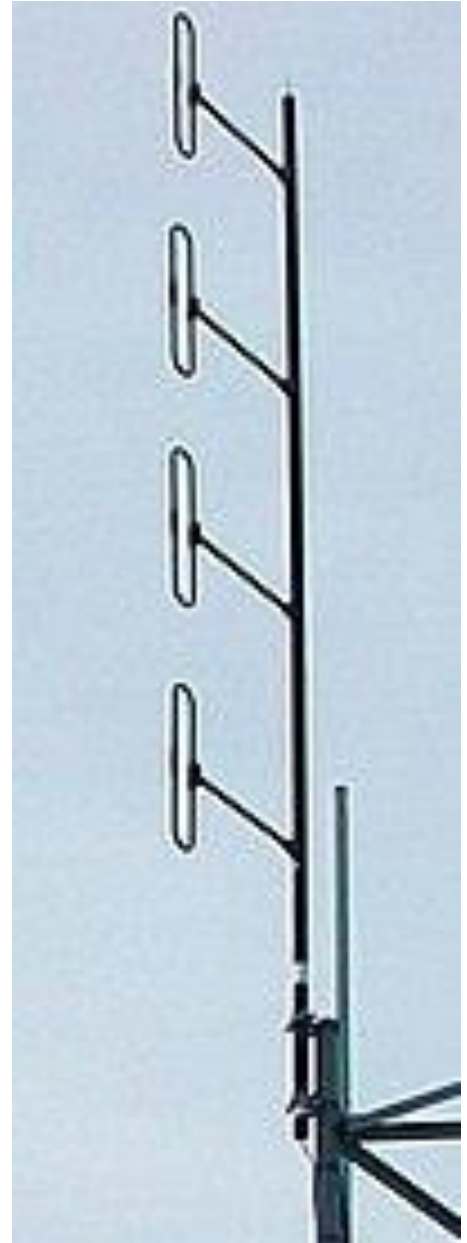
phasing), a collinear array can be constructed of coaxial elements. This type of antenna would normally be flimsy, except the coaxial elements are usually housed in a fiberglass radome in commercial arrays. The elements may be quarter-wave or half-wave. Of course, using half-wave elements makes the antenna twice as large, but more effective. Added gain is negligible beyond eight elements. The bottom element would connect to 50-ohm coax, with a ferrite toroid at about a half wavelength from the element to prevent RF on the outer shield from reaching the transceiver. The length of each segment must be the same, and the tolerance increases dramatically with frequency. The distance between elements must be zero, theoretically, which of course is not practical but constructing something like this is not for the faint of heart. Making a UHF collinear antenna with coaxial elements is best left up to commercial manufacturers.

Such a concept (without the radome) is even used in some horizontal HF antennas, using alternating phase connections between coaxial elements. Extended double Zepps and two half waves in phase are examples. A $\frac{5}{8}$ th-wave radiator, which produces gain when placed over an infinite ground plane through ground-reflection image, is also a collinear configuration. That is, the $\frac{5}{8}$ th-wavelength is collinear with the ground reflection image.

There are several different configurations of coaxial collinear antennas. One configuration is a series of half-

wavelength coaxial segments with the inner and outer connections transposed at the junction of each half-wave section (that is, the inner conductor connected to the outer shield, and the outer shield connected to the inner conductor, as in the figure below). The final section can vary, depending on the design. For example, it can be a short circuit, or it can be a quarter-wavelength element. The antenna shown below is configured in a balanced format. The outer quarter-wavelength sections are shorted at the end, transforming the array to a high impedance. That is, the interface between the two segments is a high impedance, all the way back to the feed point. The feeder would be high-impedance open wire or balanced feeder, transformed by an impedance-matching circuit for matching to 50-ohm cable. The end segments have a voltage of amplitude and phase close to the antenna driving voltage. With the inner conductor connected to the shield in alternating elements, the currents flowing on the outer surface of the coax segments are the same for a given half of the antenna. Thus, each segment radiates with the same phase, combining when they are at right angles to the axis of the antenna.

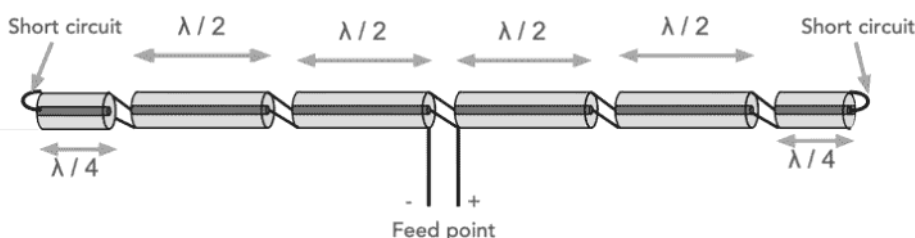
Many hams have constructed VHF/UHF collinear antennas, using half-wavelength monopole elements with phasing coils between each consecutive pair of elements to achieve phase shift. This is uncommon for commercial antennas because of coil losses, but hams construct them because the elements are self-



Collinear folded-dipole array.

supporting, without requiring a protective radome.

An effective vertical collinear antenna for 6 meters is the Diamond CP62, consisting of two stacked $\frac{5}{8}$ th-wave elements, producing about 5.5 dB gain over a vertical dipole. Diamond specifies that gain over an isotropic source (dBi), but I think that's an error, since that would typically be for only one $\frac{5}{8}$ th-wave element. It is 22 feet tall and handles 500 watts on SSB and 200 watts on FM. ★



Concept of basic balanced coaxial collinear antenna.

Icom Unveils IC-7760 HF/50 MHz Transceiver

On August 23, 2024, at the Tokyo Ham Fair, Icom released the IC-7760 HF/50 MHz 200-watt transceiver, which is the production version of their model “X60” hinted about at the Dayton Hamvention. It’s described as a connected system consisting of a remote control head and RF deck, connected with a commercially available control (LAN) cable. This allows placing the control head on a desktop and the RF deck in an area closer to the antenna feed point. In addition to the direct connect feature, a wired home network (gigabit Ethernet) allows the RF deck to be placed on any tabletop away from the RF deck, and a PC is not required.

A 9.8-foot control cable is supplied with the transceiver, and a commercially available LAN cable (Cat5e or higher, maximum 325 feet) can be used to place the RF deck in a location away from the noise of the fan used to dissipate its generated heat.

The IC-7760 has independent MAIN/SUB receivers, from the antenna to the speaker, so that one receiver section has no effect on the other, providing simultaneous reception of two signals in different bands/modes with identical performance. Dual spectrum scopes provide simultaneous display of the MAIN and SUB bands, allowing the operator to see the changing band conditions.

The IC-7760 adopts the RF direct sampling system, in which RF signals are directly converted to digital signals and the signals are processed by an FPGA (Field Programmable Gate Array). This system avoids non-linear distortions that occur in mixer stages during the analog signal processing. In addition, by employing DSP units in both the RF deck and control head, the IC-7760 is able to handle complex audio path switching due to various interface inputs and outputs, while minimizing delay in a home LAN environment.

The DIGI-SEL (Digital Pre-selector) is highly effective in rejecting out-of-band strong signals such as from broadcasting stations or multi-multi operation. In the IC-7760, which is a direct sampling system, DIGI-SEL prevents overflow (OVF) due to unwanted out-of-band signals rather than signal distortion, and the preamp uses the A/D converter to take full advantage of its dynamic range. When the preamp is turned ON in the IC-7760, the preamp enhances the intended signal first, then DIGI-SEL filters out unwanted out-of-band signals. This makes it possible that the preamp works together with DIGI-SEL.

The IC-7760 has uses an 11-separated band pass filter (BPF) in HF bands. In addition, by employing sharp filters specialized for each amateur band, the BPF efficiently attenuates out-of-band interference signals in the RF stage, and prevents overflow at the A/D converter.

The IC-7760 transmits 200 watts, 100 percent duty



cycle, using Digital Pre-Distortion (DPD) technology. The DPD function corrects non-linear distortion at the final amplifier by applying inverse distortion in advance. The DPD function also works at the 1 kW level output in conjunction with the optional IC-PW2 amplifier.

The IC-7760 incorporates a mechanical relay type internal antenna tuner. Once tuned, the matching information is automatically recalled the next time the frequency is selected.

The control head has 7-inch main and 2.4-inch sub touch-screen displays. The main display show information necessary for operation, including MAIN/SUB operating frequencies, setting/operating status of each function, as well as the spectrum scope, S-meter, and RTTY/PSK31/63 decoding messages. The sub display shows filter settings, various meters, and a band stacking register. The filter setting screen can display the IF filter passband width and IF filter shape superimposed on the IF filter passband signal.

The dual spectrum scope provides excellent sweep speed, resolution, and a wide dynamic range of 100 dB with FPGA, DSP, and CPU combined processing for MAIN and SUB bands. It can also monitor two different bands simultaneously. In the continuous scroll mode, a wide bandwidth exceeding 1 MHz can be seen on the scope screen. The waterfall display shows changes in the frequency spectrum vertically.

The audio scope screen shows the transmit and received signal’s frequency component on the FFT scope, and its waveform components on the oscilloscope. The audio scope makes it easy to monitor signal characteristics such as microphone compressor level, filter width, and notch filter. You can monitor received CW keying waveforms in the oscilloscope.

Some of the other features include automatic contest serial numbering, a preset FT8 menu, an optional RC-28 second VFO knob (connects to USB port), SD card slot for data and voice storage, I/Q signal output, and DVI-D connector for an external display. ★

OCRACES Meeting: September 9th on Zoom

The next OCRACES meeting will be on Monday, September 9, 2024, at 7:30 p.m. on Zoom. During this meeting we will include planning for the next City/County RACES & EmComm ACS Drill, which will occur on Saturday, October 5, 2024, from about 0900 to 1100 hours. ★

ARRL Discloses Ransomware Payment

The American Radio Relay League (ARRL) has confirmed that it paid \$1 million to the perpetrators of the “extensive and sophisticated” ransomware attack against its computer systems during the early morning hours of May 15, 2024. The threat actors (TAs) are believed to be the Embargo ransomware operation, using information they had purchased on the dark web. The TAs accessed ARRL headquarters on-site systems and most cloud-based systems. They used a wide variety of payloads affecting everything from desktops and laptops to Windows-based and Linux-based servers. Despite the wide variety of target configurations, the TAs seemed to have a payload that would host and execute encryption or deletion of network-based IT assets, as well as launch demands for a ransom payment, for every system.

The FBI categorized the attack as “unique” as they had not seen this level of sophistication among the many other attacks, they have experience with. Within 3 hours a crisis management team had been constructed of ARRL management, an outside vendor with extensive resources and experience in the ransomware recovery space, attorneys experienced with managing the legal aspects of the attack including interfacing with the authorities, and ARRL’s insurance carrier. The authorities were contacted immediately as was the ARRL president.

The ransom demands by the TAs, in exchange for access to their decryption tools and to prevent exposure of the stolen data, were exorbitant. ARRL said it was clear that the TAs didn’t know, and didn’t care, that they had attacked a small 501(c)(3) organization with limited resources. Their ransom demands were significantly weakened by the fact that they did not have access to any compromising data. It was also clear that they believed ARRL had extensive insurance coverage that would cover a multi-million-dollar ransom payment. After days of tense negotiation and brinkmanship, ARRL agreed to pay a \$1 million ransom. That payment, along with the cost of restoration, has been largely covered by the League’s insurance policy.

From the start of the incident, the ARRL board met weekly using a continuing special board meeting for full progress reports and to offer assistance. In the first few meetings there were significant details to cover, and the board was thoughtfully engaged, asked important questions, and was fully supportive of the team at HQ to keep the restoration efforts moving. Member updates were posted to a single page on the website and were posted across the inter-

net in many forums and groups. ARRL worked closely with professionals experienced in ransomware matters on every post. The League believes that the TAs had ARRL under a magnifying glass while they were negotiating. Based on the advice ARRL was being given, they could not publicly communicate anything informative, useful, or potentially antagonistic to the TAs during this time frame.

ARRL says most systems have been restored or are waiting for interfaces to come back online to interconnect them. While in restoration mode, ARRL has also been working to simplify the infrastructure to the extent possible. They anticipate that it may take another month or two to complete restoration under the new infrastructure guidelines and new standards.

Most ARRL member benefits remained operational during the attack. One that wasn’t was Logbook of The World (LoTW). LoTW data was not impacted by the attack and once the environment was ready to again permit public access to ARRL network-based servers, LoTW was returned into service. LoTW took less than 4 days to get through a backlog that at times exceeded over 60,000 logs. Work is continuing to return the DXCC systems to service. DXCC award processing, including the “Online DXCC” application system, is unavailable at this time. While all DXCC user data is secure and unaffected, ARRL has taken the precautionary measure of keeping the service offline until they can ensure the security and integrity of their networks. As previously reported, Worked All States (WAS) applications are being processed. WAS certificates and endorsement stickers are being mailed. VUCC applications are being processed, and VUCC certificates and endorsement stickers are being mailed.

ARRL says it is not entirely out of the woods yet and is still working to restore minor servers that serve internal needs (such as various email services like bulk mail and some internal reflectors).

The board at the ARRL Second Board Meeting in July voted to approve a new committee, the Information Technology Advisory Committee. This will be comprised of ARRL staff, board members with demonstrated experience in IT, and additional members from the IT industry who are currently employed as subject matter experts in a few areas. They will help analyze and advise on future steps to take with ARRL IT within the financial means available to the organization.

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Yaesu Unveils FTX-1F HF/VHF/UHF QRP Radio

Yaesu introduced the FTX-1F HF/50/144/430 MHz all-mode QRP portable transceiver at the recent Tokyo Ham Fair. Using SDR technology, it provides 6 watts of output power with its 5670-mAh lithium-ion battery pack (10 watts with external DC power supply). Operating modes include SSB, CW, AM, FM, and C4FM digital. It is also Wires-X compatible.

A full-color touchscreen display

shows a 3-dimensional spectrum stream. With two independent receiver circuits, it provides true simultaneous dual-band operation, with two speakers.

An optional automatic antenna tuner can be attached to the rear.

Up to five frequencies can be registered and monitored with the PMG (primary memory group) function. The MAG (memory auto grouping) func-



Yaesu FTX-1F HF/VHF/UHF radio.

tion enables memory channels to be categorized in each band.

USB ports support CAT operation, audio input/output, and TX control. ★

ARRL Urges Protecting 902-928 MHz Band

The Federal Communications Commission (FCC) accepted for public comment a [Petition for Rulemaking filed by NextNav Inc.](#), a licensee in the 900-MHz Location and Monitoring Service (LMS), to completely reconfigure the 902-928 MHz band and replace the LMS with high-powered 5G cellular and related location services.

The [FCC Notice](#) requested comment on the effects that NextNav's proposals would have on amateur radio operations in the band. ARRL® The National Association for Amateur Radio® is preparing comments urging protection of existing and future amateur uses in this band and urges all amateurs to file their own comments describing their activities in this band and the expected effect of the proposed changes. [Click here for a guide to filing comments.](#)

NextNav currently holds licenses in the 900-MHz band that authorize it to provide services limited to determining the location and status of mobile radio units. NextNav ties its request to provide high-power broadband, cellular, and location services to the vulnerabilities of the current satellite-based GPS system and argues that implementation of its proposal would complement GPS by providing an alternative nationwide terrestrial location system in addition to cellular and broadband services. Under its proposal, NextNav would be designated the sole nationwide licensee for this spectrum in exchange for its more limited licenses.

The new nationwide license would authorize NextNav to provide much higher-powered traditional broadband and 5G cellular services as well as the related location service occupying 15 of the total 26 megahertz available in the band. The reconfiguration proposed by NextNav would create a 5-megahertz-wide uplink subband at 902-907 MHz paired with a 10-megahertz-wide downlink subband at 918-928 MHz. The 5-megahertz-wide uplink subband would be limited to use by mobiles with a maximum of 3 watts ERP. On the 10-megahertz-wide downlink subband, up to 2000 watts ERP would be permitted in rural areas

and 1000 watts ERP in urban and suburban areas, radiating from tower structures that could reach 1000 or more feet above average terrain. These configurations reflect the FCC's rules for standard cellular configurations that have been adopted to govern a number of other bands used for similar 5G and like services.

Although uses by the Amateur Radio Service in this band are secondary to LMS, NextNav is proposing substantial technical and use changes that would completely alter the foundation upon which the current rules and spectrum sharing arrangements rely and undercut shared use of the band by amateurs as well as a variety of other users. In addition, NextNav proposes deletion of a specific interference provision in the Commission's rules that was adopted to encourage and protect continued sharing with amateurs and other secondary users.

NextNav, in its petition, argues without evidence that the changes that it proposes to the 902-928 MHz band "will not impede amateur operations." In an [8-page description](#) of NextNav's proposal released by the FCC's Wireless Telecommunications Bureau, the FCC staff asks a series of questions that would clarify the proposal and help the Commission ascertain the likely effect of the proposed changes on existing users if the requested changes were adopted. Comment was specifically requested on the extent of amateur operations in the band, the potential impact of the proposed changes, any other spectrum options that may exist, and the costs for relocations if other options exist.

ARRL is preparing comments urging protection of existing and future amateur uses in this band. ARRL urges all amateurs to study the proposal and file their own comments describing their activities in this band and the expected effect of the proposed changes. The filing deadline is September 5, 2024. Replies to comments are due by September 20, 2024. [Click here for a guide to filing comments.](#) ★

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



Countywide P2P Winlink Exercise By Scott MacGillivray, KM6RTE

Based on the successful previous exercises, the next countywide Winlink Peer-to-Peer (P2P) practice exercise is planned for the morning of Saturday, September 14, 2024. This exercise provides an opportunity to gain experience using the Winlink P2P Operating Mode.

The exercise will again focus on sending a Winlink P2P message with an attached form to “Drill Ops” located at Loma Ridge in central Orange County. Details are fully described in the instructions currently being finalized and will be distributed prior to the exercise.

It is important to note that this is an informal practice exercise (organized by me) 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 Radio Message Server (RMS) or “gateway” for connection to the internet. It is valuable to understand how to operate this mode since it is expected to be a critical Winlink mode used after a major disaster when phone, text, and internet services are not available in our area. I highly recommend that you take advantage of this exercise to gain experience with P2P. However, make sure your Winlink equipment can operate using conventional mode (i.e., using a local a “gateway”) before participating in this drill. The main 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.

You are encouraged to forward this email to other individuals and organizations that you feel might be interested in taking advantage of this practice exercise. This includes any operators that can reach Loma Ridge directly or through a Winlink gateway operating as a relay.

For more information on Winlink Glob-

al Radio Email: <https://www.winlink.org/>.

If you have questions or comments, please don’t hesitate to contact me at csmac-g67@outlook.com.

Orange County Amateur Radio Club (OCARC)

The next OCARC meeting will be on Friday, September 20, 2024, at 7:00 p.m., at the American Red Cross (George M. Chitty Building), 600 Parkcenter Drive, in Santa Ana.

Orange County Fire Watch

Madi Killebrew, Program Manager—Fire Prevention & Management, Irvine Ranch Conservancy, reported that Renalynn Funtanilla became the new Orange County Fire Watch Coordinator on August 28, 2024, replacing Tony Pointer.

OCRACES Member Jack Barth, AB6VC, Silent Key

As reported in the June 2024 issue of *NetControl*, OCRACES member Jack Barth, AB6VC, passed away on May 8th. He was also a PSR in the Sheriff’s Search & Rescue Reserve Unit. His funeral was on May 20th. A Celebration of Life for Jack will be held on Sunday, October 6th. See his family’s invitation below. RSVP to rn2river@gmail.com if you plan to attend.

PLEASE JOIN US IN

A Celebration of Life

for

Jack Barth

October 8, 1947 - May 8, 2024

.....

Sunday, October 6, 2024
2:00 pm - 6:00 pm

Lake Mission Viejo Clubhouse
22555 Olympiad Road
Mission Viejo, CA 92692

Food will be served

We would love for you to join us and share your stories and favorite memories of Jack.

Please RSVP by
Sunday, September 15th: rn2river@gmail.com

September 2024

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2 Labor Day	3	4	5 Orientation for PSR Applicants	6	7 Weekly 60 m ACS Net
8	9 Weekly 2 m ACS Net & OCRACES Meeting	10	11	12	13	14 Weekly 60 m ACS Net
15	16 Weekly 2 m ACS Net	17	18	19	20 Orange County Amateur Radio Club Meeting	21 Weekly 60 m ACS Net
22	23 Weekly 2 m ACS Net	24	25	26	27	28 Weekly 60 m ACS Net
29	30 ACS Nets on 4 Bands					

Upcoming Events:

- **September 2:** Labor Day, no net, no meeting
- **September 5, 1830 hours:** Orientation for Professional Services Responder (PSR) applicants, Orange County Sheriff's Regional Training Academy, 15991 Armstrong Ave., Tustin
- **September 9, 1930-2130 hours:** OCRACES Meeting
- **September 20, 1900 hours:** Orange County Amateur Radio Club meeting, American Red Cross (George M. Chitty Building), 600 Parkcenter Drive, Santa Ana.
- **October 5, 0900-1100 hours:** City/County RACES & EmComm ACS Drill



County of Orange RACES Frequencies

60 m: 5371.5 kHz USB (dial) (Channel 4) (OC ACS Net—Saturdays, 1000 hours)
 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

<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.

OCSD RACES Coordinator

Lee Kaser, KK6VIV, (714) 628-7081

Chief Radio Officer

Ken Bourne, W6HK, (714) 997-0073

Radio Officer

Scott Byington, KC6MMF

Assistant Radio Officer

Randy Benicky, N6PRL

County of Orange RACES

Orange County Sheriff's Department, Emergency Management Division
 2644 Santiago Canyon Road, Silverado, CA 92676
 Telephone: (714) 628-7081 • Fax: (714) 628-7154
 Email: LKaser@OCSheriff.gov

County of Orange RACES

OCSD Emergency Management Division
2644 Santiago Canyon Road
Silverado, CA 92676

Telephone – (714) 628-7081
Fax – (714) 628-7154
E-mail: LKaser@OCSSheriff.gov

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

Questions or Comments?
Contact *NetControl* Editor Ken Bourne, W6HK
kbourne.ocsd@earthlink.net



**“W6ACS ...
Serving
Orange County”**

Meet Your County of Orange RACES Members!

Officers →



Ken Bourne
W6HK

Scott Byington
KC6MMF

Randy Benicky
N6PRL

**OCSD
RACES
Coordinator** →



Lee Kaser
KK6VIV



Heide Aguire
K3TOG

Joel Bishop
AJ6ZP

Eric Bowen
W6RTR

Ted Lavino
KG6LZP

Steve Livingston
NJ6R

Scott MacGillivray
KM6RTE

Robert Moore
KW6B



Ryan Moore
KN6WSJ

Ron Mosher
K0PGE

Fran Needham
KJ6UJS

Chi Nguyen
KE6MVS

Joe Selikov
KB6EID

Robert Stoffel
KD6DAQ

Chuck Streitz
KK6HFS

Ken Tucker
WF6F