December 2020

Newsletter of the County of Orange Radio Amateur Civil Emergency Service

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OCRACES Online Meeting on Zoom:

Monday, December 7, 2020, at 7:30 PM

Orange County Sheriff's Department
Technology Division

Captain's Corner

by RACES Captain Ken Bourne, W6HK, Chief Radio Officer

Repeater Cavity Filters

Many years ago, I was involved in building one of the first repeaters in the Chicago area, with the Wheaton Community Radio Amateurs. I quickly became familiar with cavity filters, which allowed the repeater to use just one antenna (on my 68-foot backyard tower) while simultaneously transmitting and receiving. I connected and tuned a very used four-cavity Sinclair duplexer that drifted like crazy, requiring retuning every few days. Cavities, having no active components, shouldn't drift, but these did, for some strange reason!

Cavity filters are resonant filters that pass desired RF signals within a particular frequency range or reject RF signals with a frequency range. The resonant cavity within these filters is typically constructed from highly conductive and dimensionally stable metals in the shape of a cylinder or rectangular box, with input and output coupling loops.

Cavities augment filters built into a radio by preventing interaction between transmitters in combining systems, by reducing off-frequency sideband noise and harmonic or spurious outputs from transmitters, and by protecting receiver front-end and automatic gain control (AGC) circuits from off-frequency energy.

Most cavities are internally ¼ or ¾ of the wavelength of the center frequency. Consequently, the OCRACES 6-meter and 10-meter repeaters are "split site," with the receiver at one site and the transmitter at another site, linked on another band, because the size of cavity filters at a single-site location would be prohibitive. (For example, a ¾-wavelength cavity at 6 meters would be about 14 feet tall, and at 10 meters would be about 24 feet tall.)

In this eight-cavity duplexer for a 2-meter repeater, four notch cavities are used for receive and four pass cavities for transmit.

Protruding from the center of the cavity is a fixed axial rod. Inside of that rod is an adjustable axial rod, with a tuning knob to slide it in and out. Adjusting the inside rod length varies capacitance between it and the cavity's body, in parallel with the inductance of the fixed rod. Some cavities have an adjustable dielectric rod acting as a capacitor in series with a coupling loop, providing a tunable series LC circuit to the antenna connector. The internal wavelength is affected not only by the length and width of the axial rod but also by the length, width, shape, and angle of the coupling loops (which also affects bandwidth),

Continued on page 2

Captain's Corner Continued from page 1

capacitors or other internal components, and external cables, such as those that interconnect multiple cavities. Those interconnecting cables should be x/4 of the wavelength of the center frequency, to maintain the entire cavity system at x/4 wavelength (¼ or ¾, typically). Linking cavities forms a duplexer, allowing a repeater's transmit and receive antenna connections to be linked to a single antenna, while the repeater transmits and receives on different (offset) frequencies.

Cavity filters pass the desired frequency and reject undesired frequencies. They are often grouped in series to achieve a passband that is "deeper" with respect to surrounding frequencies, such as from a nearby unassociated transmitter.

Cavities are more effective than other tuned circuits because of their higher "Q" (quality or sharpness between frequencies that are passed and the frequencies that are attenuated). The base "Q" is determined by the distance between the coupling loops and the inner conductor, and the angle of the loops relative to the inner conductor. Some cavity manufacturers do not provide a distance adjustment or an angle adjustment.

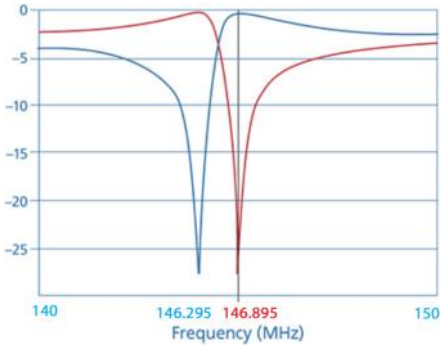
Cavities have insertion loss, typically around 1 to 2 dB. Stringing cavities together provides higher "Q" with lower system insertion loss.

Cavity configurations include pass cavities, notch cavities, and pass/reject cavities. A **pass cavity** allows a frequency or a frequency "window" to pass, while attenuating (blocking) all frequencies above and below the window. A pass cavity has two coupling loops, one in series with the input connector going to the radio or repeater, and the other in series with the output connector going to the antenna. Insertion loss is adjustable, usually up to a maximum of 2 dB, with an indicator to enable setting both sides equally. While adjusting the center frequency with the inner conductor (axial rod), the loop angle must be changed to keep the "Q" constant. If the insertion loss is increased beyond 2 dB, the bandwidth of acceptable return loss is decreased. In that case, there might be a desired high return loss at the center of the pass bandwidth, but the return loss at the edges of the occupied bandwidth might be too low, resulting in high sideband energy reflection. Cavities may be placed in series (with equal insertion loss) to achieve additional attenuation outside the pass frequency (including odd harmonics) or to achieve additional "Q." Passband symmetry may be manipulated by adjusting the two coupling loops to different angles relative to the inner axial rod, for different attenuation levels above and below the pass frequency. Placing multiple pass cavities in series allows deeper overall attenuation outside the passband, sharper slopes (narrower skirt selectivity), and a wider passband (such as for a preselector).

A **notch cavity** rejects a frequency or a frequency "window," while passing all other frequencies. It has a finite pass window above and below the rejected frequency. It has one coupling loop, in parallel (via a tee connector) with the cable that connects the radio or repeater to the antenna. Some lower frequency notch cavities might have a short cable between the tee and the cavity connector, to help match the internal coupling loop to frequencies above and below the notch frequency and overcome unpredictable, narrowband pass/reject response that varies with inner axial rod adjustments. Placing notch cavities in series via the tee connector allows deeper notch attenuation and widening of the notch bandwidth (but with less sharp slopes). Placing notch cavities in series somewhat attenuates signals outside the notch.

A **pass/reject cavity** combines pass and a notch cavities into one configuration. Its notch is usually as deep as a notch-only cavity, but attenuation outside the pass and notch frequencies is not as deep as a pass-only cavity. A pass/reject cavity is used in pairs or multiple pairs in a repeater duplexer configuration. The pass/reject cavity has one coupling loop in parallel (via a tee connector) with the cable that connects the repeater to the antenna. The pass frequency is adjusted with the inner axial rod. Some manufacturers provide notch adjustment with a variable capacitor accessed through a slot near the coax connector. The notch "follows" the pass frequency as the inner axial rod is tuned. Placing multiple pass/reject cavities in series (via the tee connectors) adds some insertion loss to the signals within the passband, but provides deeper attenuation of the frequencies within the notch, widening of the notch bandwidth (with less sharp slopes), and deeper attenuation of the frequencies beyond the pass and notch frequencies.

The bandwidth of a pass cavity is not sufficiently narrow for a repeater duplexer, especially on 2 meters with 600 kHz offset. Consequently, a notch cavity is also required. It notches only a narrow band of frequencies, but that's what is necessary in a repeater duplexer, to keep the transmitter frequency out of the receiver.



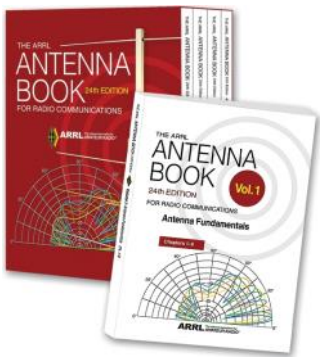
Simulated pass and notch responses in a pass/reject cavity duplexer for the OCRACES 2-meter repeater.

Radio Spectrum Sampler at Zoom Meeting

Ray Grimes, N8RG, will give a fascinating and informative presentation on Zoom at the next OCRACES meeting. The title of his PowerPoint presentation is "Radio Spectrum Sampler—2020 and Beyond." He will discuss all the LMR (Land Mobile Radio) bands relative to current FCC Rules changes, programs, and policies as they are driven by a "big business" economy philosophy as mandated by Congress and facilitated by the FCC. Because we are still faced with the COVID-19 pandemic, this meeting will again be on Zoom, on Monday, December 7, 2020, at 7:30 PM. The meeting ID and password will be sent to the mailing lists for OCRACES members and applicants and city RACES and MOU officers, members, and coordinators. Joe Selikov, KB6EID, will once again be the meeting host. For security reasons, please use the latest version of Zoom, which currently is 5.4.3.

Sadly, OCRACES will forego its annual Holiday Dinner this December, due to the pandemic, but we are looking forward to extending holiday greetings at our Zoom meeting on December 7th at 7:30 PM. We know you will enjoy Ray's presentation.

New: *ARRL Antenna Book* Boxed Set



The *ARRL Antenna Book for Radio Communications* is available as a limited-edition boxed set showcasing 80 years of antenna know-how. Its 1,024 pages are divided into four volumes packaged in a hard slipcase, covering major topic areas:

- Antenna Fundamentals
- Antennas for LF/MF/HF
- Antennas for VHF through Microwave and Specialty Antennas
- Transmission Lines and Building Antenna Systems, and Index

New and time-tested antenna projects across nearly any frequency and mode are included. A download code is provided to install a highly searchable digital edition. Updated content includes:

- New coverage of small transmitting loops
- New and expanded coverage of microwave antennas
- Many new MF, HF, and 6-meter antenna design articles
- Instructions to acquire HFTA terrain profiles online
- An overview of VHF/UHF rover antenna systems
- New chapter on VHF/UHF antenna systems
- Rotator ratings, installation, and maintenance
- Updated transmitting choke design and selection
- Updated ground system analysis and detailed set of ground conductivity maps
- Updated propagation and solar activity information, and new sunspot data definitions
- New material on MF band propagation
- Log-periodic BOLPA antenna design
- Updated coverage of antenna modeling software
- K1EA transmission-line method for switching stacked antennas
- Powerboat antenna system grounding
- Updated treatment of wire antenna construction materials
- Expanded material on grounding and bonding
- Updated antenna analyzer techniques
- Antenna tuner troubleshooting
- Updated content for low-band receive antennas

ISBN: 978-1-62595-114-4. Item No.: 1144. Price: $64.95. Publisher: The American Radio Relay League, Inc.

Volunteers Needed for Propagation Research

HamSCI (https://www.hamsci.org) is looking for amateur radio operators around the world to help collect propagation data during the December 14, 2020, eclipse across South America. Data collection requires an HF radio connected to a computer.

There will be a 24-hour practice run on December 5th, following the practice run that occurred on November 21st. The main data recording will run from December 9-16, to ensure an abundance of control data.

Details of the experiment may be found at https://hamsci.org/december-2020-eclipse-festival-frequency-measurement. Interested operators should sign up at https://forms.gle/C9PFSTeLf7xvCQDYA or directly contact Kristina Collins at kd8oxt@case.edu.

New: Compact Yaesu FTDX10 SDR Radio

Yaesu FTDX10 SDR transceiver.

Yaesu has announced the FTDX10 HF and 50 MHz 100-watt hybrid SDR transceiver. The down-conversion type receiver configuration with the first IF at 9 MHz allows narrow-bandwidth crystal roofing filters (500 Hz, 3 kHz, and 12 kHz) with sharp "cliff edge" shape factor. The reciprocal mixing dynamic range (RMDR) reaches 116 dB or more, the close-in blocking dynamic range (BDR) reaches 141 dB or more, and third-order intermodulation dynamic range (3rd IMDR) reaches 109 dB or more in the 14-MHz band at 2 kHz separation. The local circuit uses a 250-MHz high-resolution direct digital synthesizer method to improve the carrier to noise (C/N). The phase noise characteristic of the local signal achieves –145 dB or less in 14 MHz at 2 kHz separation.

The 5-inch full-color TFT touch display shows a 3-dimensional spectrum stream (3DSS). Touching the display provides a numeric keypad for setting the active band and frequency. Frequency setting and adjustment can also be performed by turning the MAIN dial or touching the scope display. The MULTI display, RX operation status display, Center, FIX, and Cursor modes are available. The FTDX10 includes 15 separate bandpass filters, IF DSP, automatic antenna tuner with 100-channel memory, QMB (quick memory bank, and band stack function. HRO is offering this transceiver at $1,699.95 (after coupons and promotions).

USCG Might Cease HF Voice Watchkeeping

The US Coast Guard has invited comments by January 21, 2021, on a proposal to discontinue HF voice watchkeeping. The proposal appeared on November 20 in the *Federal Register*. The USCG proposes to cease monitoring 4125, 6215, 8291, and 12,290 kHz, in the contiguous US and Hawaii, due to a lack of activity.

"We believe this change would have a low impact on the maritime public, as commercial satellite radios and Digital Selective Calling (DSC) marine-SSB HF radios have become more prevalent onboard vessels," the Coast Guard said. "However, we would like your comments on how you would be affected if we terminated monitoring HF voice-only distress frequencies within the contiguous US and Hawaii, particularly if you use HF, but do not currently have a commercial satellite radio or an HF DSC-capable radio aboard your vessel."

The Coast Guard said it would continue to monitor HF DSC distress alerting for all existing regions and voice distress and hailing from Kodiak, Alaska, and Guam. The Maritime Mobile Service Net (MMSN) on 14.300 MHz remains available to less-equipped mariners who need assistance in emergencies.

FEMA Seeking Reserve Telecomm Operators

The Federal Emergency Management Agency (FEMA) is seeking telecommunications operator reservists to assist in emergency recovery efforts on an intermittent, on-call basis. The deadline to apply is December 8, 2020, but FEMA will not take any applications beyond the first 200, which may come sooner than that.

These FEMA reservist positions seem well suited to radio amateurs. Duties include sending, receiving, and distributing HF radio messages between first responders using the phonetic alphabet, Morse code, call signs, continuous wave, and proper frequencies based on network requirements, as well as setting up, establishing, and maintaining an HF radio site in an austere environment and performing site analysis to determine an optimal location.

Among other requirements, candidates should have an understanding of radio wave propagation for day, night, and transitional period frequency use, and be able to maintain station message logs and compile communication reports.

The Reservist Program is an appointment type granted under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Section 306(b), which authorizes FEMA to appoint such temporary employees as necessary to accomplish work authorized under the Act. See the position description on the USAJobs website at https://www.usajobs.gov/GetJob/ViewDetails/585313700 for complete information.

CPRA Awards Technology and Control One

On November 19, 2020, the California Public-Safety Radio Association (CPRA), which is the Southern California chapter of the Association of Public-Safety Communications Officials (APCO) International, recognized OCSD Technology Division and Control One personnel. Robert Stoffel, KD6DAQ, hosted the awards ceremony.

Senior Telecommunications Engineer Nick Condaras, KD3QY, Receives RF Engineer of the Year Award

In his role, Nick oversees the day-to-day operations of the Technical Services Unit, with its highest core responsibility being the 24/7 operations and immediate emergency response for the county and 34 cities who operate on the 800-MHz Countywide Coordinated Communications System and other operational mutual-aid radio networks. Nick and his team are responsible for the template development and programming of over 18,000 radios, all dispatch-center equipment, and installation, maintenance, and repairs for the county and partner agencies. He is responsible for overseeing the patrol video system in law-enforcement vehicles, including installation, repair, maintenance, contract obligations, and storage. Less than a year ago, Nick's team was the Mobile Systems Unit, and he stepped up to absorb the Dispatch Systems Unit, forming the new Technical Services Unit. This adds to his daily work load the responsibility for all dispatch centers throughout the county, base stations, hospitals, and mitigating coverage issues by providing bidirectional amplifier installations in various county facilities. Nick is responsible for the planning, design, evaluation, implementation, and maintenance of complex telecommunications systems and equipment while providing leadership, training, and coaching to a team of 29 engineers and technicians.

Emergency Communications Coordinator Peter Jimenez, KI6UTE, Gets RF Technologist of the Year Award

Peter has been with the Orange County Sheriff's Department for almost 13 years, and has worked through the ranks of Utility Worker, Technician, and Engineer, and, in July 2020, was promoted to Emergency Communications and Training Coordinator. Earlier, in 2019, as a Telecommunications Engineer, Peter was directly responsible for radio testing, template development, and programming for the over 18,000 800-MHz radios, along with radio installation, maintenance, and repairs. With his July promotion, he is solely responsible for user training, updating, standard operating procedures, radio code books, and communications coordination among all the local, state, and federal radio partners. On any given day, Peter can be presenting radio training, attending the fire chiefs operations meeting, overseeing the county RACES team, partnering with division staff for radio failure and coverage testing, and working through interoperable solutions with local, state, and federal agencies. Peter is the first point of contact for radio users, whether it be for interest of joining the 800-MHz system or with requests for training, where Peter would either schedule himself to complete, and in person, agency-specific training sessions, or provide the agencies with pertinent training materials, which he personally creates. Passionate about public safety, Peter ensures that training and education stays relevant, being enrolled in ICS training, the academy instructors certification course, and working towards his bachelor's degree in emergency management. He is also one of the county's EOC responders during an EOC activation.

Special Recognition Is Awarded to Control One

Control One received this recognition for the special role they play in public-safety communications in Southern California. Control One is part of the Emergency Communications Bureau of the Orange County Sheriff's Department and is responsible for the operation and coordination of the Countywide Coordinated Communication System (CCCS) for Orange County. This system serves all city and county agencies within Orange County. But more than just operating the radio system, Control One is also the 24-hour notification center for Orange County alert & warning, emergencies, and multi-jurisdictional events. They are responsible for communications interoperability, emergency radio traffic, and radio coordination between paramedics and area hospitals. In a catastrophic event, Control One would assist in coordinating talk-group usage in a radio system failure environment. The personnel receive extensive training in communications interoperability, reading CLETS (California Law Enforcement Telecommunications System) printouts, public alert & warning including EAS and WEA, Cal OES disaster notifications, radio system failure training, and mass-casualty incident paramedic coordination. When Orange County is having a really bad day, it is Control One that assists all of Orange County's agencies in maintaining communication functions.

Supervising Communications Coordinator Derek Gard, KK6VGY, Is Honorable Mention Supervisor of the Year

This award is for Derek's work in promoting interoperability and public-safety radio communications. Derek has been part of an outreach program to discuss ways Control One and the Orange County Sheriff's Department can assist the many cities of Orange County with their communication needs. As the Chairman of the Southern Planning Area for CalSIEC (California Statewide Interoperability Executive Committee), Derek has promoted the sharing of radio template information with agencies throughout Southern California, including Los Angeles Sheriff, Riverside Sheriff, San Diego Sheriff, and Long Beach Police. Derek developed test procedures to assist in spreading familiarity with interoperable procedures throughout Southern California. He is an advisor to several Cal OES committees, as well as various Orange County committees. He serves as a subject matter expert for exercises and large events in Orange County. Currently, he is planning the largest full-scale communication exercise to ever be held in Southern California (scheduled for April 2021). He is also part of responses to the EOC and DOC when needed. Derek is an All-Hazards Communications Unit Leader. He has met the requirements of Cal OES for Alert & Warning Practitioner. Derek has been an OCSD Supervisor of the Year and a Medal of Merit recipient.

RACES/MOU News from Around the County

"RACES/MOU News" provides an opportunity to share information from all City & County RACES/ACS units and MOU organizations and supportive amateur radio clubs in Orange County.

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

kbourne.ocsd@earthlink.net

Anaheim RACES

60-Meter Operations

By Anaheim RACES Chief Radio Officer Ducky Breton, KW6ACK

On Saturday morning, November 14, 2020, at 1643 hours, volunteers of the Anaheim RACES team gathered at the City of Anaheim Emergency Operations Center to activate our Volunteer Communications Unit Emcom trailer.

In attendance were Ramona Head, KM6TZL, Greg Gerovac, K6GYO, Anton Hochschild, KM6OQY, and myself.

We had a short briefing. The EOC was unlocked and coffee was made for those who wanted it. There were light munchies available.

At 0830 hours, training was activated. The first task was to set up a 60-meter NVIS (Near Vertical Incidence Skywave) antenna that was a project concept built by one of our team mates, Greg, K6GYO.

The antenna consisted of a bucket of cement holding a center mast. The mast is a lockable painter's pole. The antenna wire and matching elements connect to the top of the pole and stretch out approximately 50 feet in an inverted V formation. This configuration allows for contacts in the 5-250 mile range.

After the antenna was secured, it needed to be tested for a proper Standing Wave Ratio (SWR). The SWR was in the compliance range of operations of the antenna.

Next, the coax cable was connected to the antenna base. The cable was uncurled and connected to the radio tuner. After several attempts to make a contact, several minor adjustments needed to be made.

Finally, there was a test contact at 0943 hours to Roy Shlemon, K6GVG, in Bonsall (Northern San Diego County). Received signal report of 59, sent signal 59 (excellent signals). The antenna and HF radio station worked perfectly.

At 1000 hours local the Orange County RACES/ACS 60-meter net was conducted. Ken Bourne, W6HK, was the Net Control Operator (NCO). After announcements and a pause for any emergency traffic, the NCO started a roll call of the Cal OES Southern Region area.

As Anaheim RACES is at the start of the roll call, Greg, K6GYO, answered up and gave this report: "This is W6APD for the City of Anaheim EOC, operating from our Emcom trailer. We are using an Icom 718 radio at 100 watts, inverted V portable antenna, NVIS, at 14 feet. Operator Greg, K6GYO, W6APD clear."

Everything worked perfectly.

We listened to the net for several minutes after our check-in to see/hear the other cities and counties checking in to the Net.

As it was almost 1030 hours, I gave the direction to break down, put away, and clean up. All equipment used was sanitized. Masks were worn by all RACES team members. Safety protocols were maintained except for pictures. The EOC was cleaned after our use.

The EOC was locked and alarmed at 1100 hours.

Newport Beach RACES

Newport Beach RACES Chief Radio Officer Steve Livingston's call sign has changed from KM6JON to NJ6R.

December 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5 Weekly 60 m ACS Net
6	7 Weekly 2 m ACS Net & OCRACES Zoom Mtg	8	9	10	11	12 Weekly 60 m ACS Net
13	14 Weekly 2 m ACS Net	15	16	17	18	19 Weekly 60 m ACS Net
20	21Weekly 2 m ACS Net	22	23	24	25 Merry Christmas!	26 Weekly 60 m ACS Net
27	28 ACS Net on 4 Bands	29	30	31		

Upcoming Events:

- **December 7:** OCRACES Meeting on Zoom, 1930 hours
- **December 25:** Christmas

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 (out of service)
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)
23 cm: 1287.650 MHz, 1287.675 MHz, 1287.700 MHz, 1287.725 MHz, 1287.750 MHz, and 1287.775 MHz outputs, –12 MHz inputs, 88.5 Hz PL

*Primary Net—Mondays, 1900 hours

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OCSD Sr. Telecommunications Engr.
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Ken Bourne, W6HK, 714-997-0073

Radio Officer (Lieutenant)
Scott Byington, KC6MMF

Assistant Radio Officers (Sergeants)
Jack Barth, AB6VC
Ernest Fierheller, KG6LXT
Bob McFadden, KK6CUS
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County of Orange RACES

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Questions or Comments?
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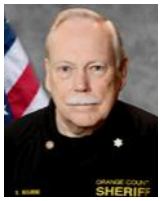
"W6ACS ... Serving Orange County"

Meet Your County of Orange RACES Members!

Officers



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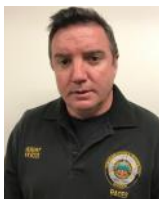

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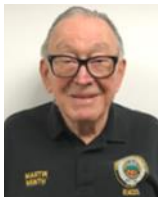
Ray Grimes
N8RG

Lee Kaser
KK6VIV

Walter Kroy
KC6HAM



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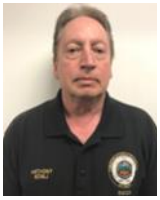
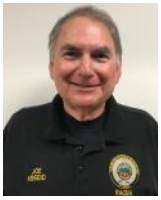


Tony Scalpi
N2VAJ



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