March 2013

County of Orange RACES

NetControl

Newsletter of the County of Orange Radio Amateur Civil Emergency Service

The Next OCRACES Meeting Is

March 4, 2013

1930 Hours

840 N. Eckhoff Street, Suite 104, Orange

Featured Speaker: Ray Grimes, N8RG ADS-B

Orange County Sheriff's Department Communications & Technology Division

Captain's Corner
by RACES Captain Ken Bourne, W6HK, Chief Radio Officer

Digital Voice on HF

OCRACES owns some AOR digital voice modems for HF, but so far has not put them to use. Radio amateurs are also using four types of software for transmitting digital voice on the HF ham bands—WinDRM, DRMDV, FDMDV, and FreeDV. WinDRM and DRMDV are based on Digital Radio Mondial (DRM), a system adapted for use on amateur radio by Francesco Lanza, HB9TLK. Cesco also developed FDMDV (Frequency Division Multiplex Digital Voice), and designed the modem based on advice from Peter Martinez,

G3PLX, who also developed PSK31. Peter also advised David Rowe, VK5DGR, on the FDMDV modem used in FreeDV. DRM and DRMDV signals are wider than the 1.1-kHz bandwidth of FDMDV/FreeDV, but they incorporate Forward Error Correction (FEC), while FDMDV/FreeDV does not. FDMDV/FreeDV, DRM, and DRMDV are incompatible with AOR Digital Voice, D-STAR, and each other. In this article, I will focus on FDMDV/FreeDV.
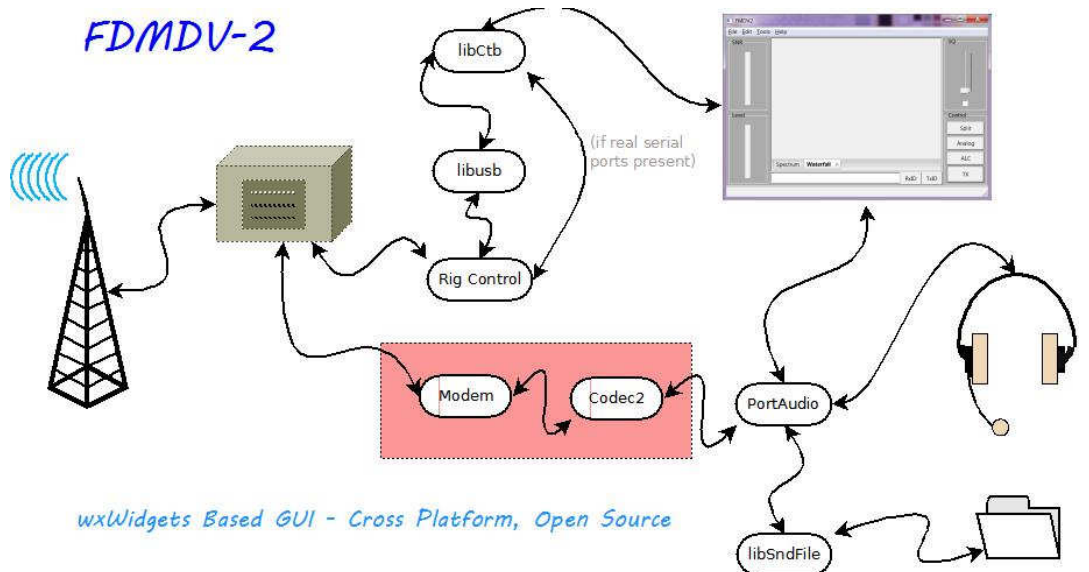
In the "Watching the Web" column on page 5 of this issue of *NetControl*, we review a Web site that features FreeDV, a

Dave Witten, KDØEAG, is building a GUI application called FDMDV-2 that can run on Linux and Windows. This GUI application will include Codec2 and the FDMDV modem, and will connect to an SSB transceiver to create a digital-voice system for HF radio. This block diagram, drawn by Dave, is shown on the http://www.rowetel.com/blog/?page_id=452 Web page by David Rowe, VK5DGR, who was awarded the 2012 ARRL Technical Innovation Award for his work on Codec2.

Captain's Corner *Continued from page 1*

GUI application that allows any SSB radio to be used for low-bit-rate digital voice. Mel Whitten, KØPFX, contributed to the design, testing, and promotion of several digital voice systems, including FDMDV, leading to the current fast-sync, no-FEC, low-latency design. FreeDV uses an FDMDV modem and Codec2, all open source. FDMDV on HF provides high-quality digital voice (no background noise) under poor band conditions, in only 1100 Hz bandwidth—less than half the bandwidth of an SSB signal.

The ARRL awarded David Rowe, VK5DGR, the 2012 ARRL Technical Innovation Award for his work on Codec2. It provides telephone-quality voice, comparable to codecs used on landline, cell phones, and VoIP, while using one-eighth of the bandwidth or less. Using the FDMDV-derived soft-modem, Codec2 works well on existing HF SSB transceivers, using the same setup as other digital modes. It can also be carried on VHF/UHF FM audio.

Using a GMSK (Gaussian Minimum Shift Keying) or C4FM (Continuous 4 Level Frequency Modulation, used in APCO P25 Phase 1 systems and in Yaesu's yet-to-be-available FT1DR/E HT that might not be P25-compatible) modem for VHF/UHF, Codec2 has a potential for 2-kHz channels. For example, with Codec2 you could fit 10 voice channels between 144.10 and 144.12 MHz. It offers less than one-half the bandwidth of D-STAR, less than one-quarter the bandwidth of DMR (digital mobile radio, including Motorola's MOTOTRBO), and one-half to less than one-quarter the bandwidth of APCO P25 systems, even Phase 2 and CQPSK (Compatible Quadrature Phase Shift Keying). It provides double the power efficiency (and thus the range) of wider-bandwidth modes. It can use nonlinear amplifiers, for improved battery life.

As described on David Rowe's Web site, "Codec2 is an open-source, low-bit-rate speech codec designed for communications-quality speech at 2400 b/s and below. Applications include low-bandwidth HF/VHF digital radio and VoIP trunking. Codec2, operating at 2400 b/s, can send 26 phone calls using the bandwidth required for one 64-kb/s uncompressed phone call. It fills a gap in open-source, free-as-in-speech voice codecs beneath 5000 b/s and is released under the GNU Lesser General Public License (LGPL)."

Codec2 experimenters are running various bit rates, currently from 1200 to 2400 b/s, and now also at 3200 b/s. Voice quality improves with higher bit rates. The codec is separate from the modem, modulation, and error correction. The best modulation and error correction is chosen for a particular channel.

Codec2 was developed as an open-source alternative to vocoders (voice encoders) such as AMBE. D-STAR is licensed by DVSI, Inc., to use the AMBE vocoder. Therefore, Icom must pay a royalty to DVSI, but the cost is quite small. Nevertheless, hams don't like to pay for something they can do themselves for free—thus, Codec2 is attractive.

Open-source code for both the codec and soft-modem is available for download. Any amateur radio manufacturer may use Codec2, at no charge and with no agreements to sign. In fact, I first learned about Codec2 from reading a comment on an Elecraft reflector, urging Elecraft to incorporate this form of digital voice in future HF products.

Being free is a benefit to radio amateurs, but what's more important is that the Codec2 algorithm provides a very low bit rate, which means that the transmitted signal bandwidth is very narrow. Even such a narrow bandwidth sounds good (although I'm sure ESSB and AM "purists" will disagree with me!). For example, play the video at http://freedv.org/tiki-index.php?page=video. Not only can we pack more channels into an already crowded spectrum, but, more importantly, these very narrow signals have a greater power efficiency.

Power efficiency increases with decreasing signal bandwidth. That's why low-power CW signals get through when higher power SSB signals often do not. An SSB signal is about 3 kHz wide, while a CW signal is a hundred times narrower. A receiver's bandwidth, when adjusted to receive SSB, picks up much more noise than when it is adjusted to pick up a CW signal. Noise is directly proportional to bandwidth. Therefore, a digital-voice signal, which is much narrower than an SSB signal (which, in turn, is narrower than an AM signal), will get through when sometimes an SSB signal will not. Furthermore, a recovered digital-voice signal processes out the background noise that is usually heard with an SSB signal, although at very low bit rates the "digital" effect on the recovered audio might be noticeable.

David Rowe is actively working on Codec2 improvements. He is now looking at some FEC protecting the first 24 bits to give good performance on HF multipath channels, with intelligibility similar to analog SSB—but without the noise. He says the next step is to modify the octave modem simulation to support 8PSK as well as QPSK, and a run-time defined number of carriers. This can then be used to generate waveforms that can be played over the air or through the channel simulator. He will then build up some command-line programs to send codec frames that include various FEC combinations.

Next OCRACES Meeting: March 4th

The next County of Orange RACES meeting will be on Monday, February 4, 2013, at 7:30 PM, at OCSD Communications & Technology Division, 840 N. Eckhoff Street, Suite 104, in Orange. Ray Grimes, N8RG, will make a PowerPoint presentation highlighting the ADS-B (Automatic Dependent Surveillance-Broadcast) system that is replacing traditional VHF air navigation facilities throughout the United States and many other countries. ADS-B is the key component in the FAA's future NextGen program that will facilitate real-time availability of flight planning information (maps and charts, weather, flight restrictions, facility outages), enroute information (including routine weather, severe weather forecasts, radar summaries, winds aloft, restricted areas, airport diagrams, and air traffic separation maps), and, ultimately, direct point-to-point high altitude air navigation with minimal controller intervention. The goals of ADS-B and NextGen are to replace the aging ground-based air traffic radar systems, provide air traffic information and separation in locations previously unsupported, and to greatly reduce the system support and maintenance cost burden to the FAA. ITT Corporation was selected in August 2007 as the prime contractor for ADS-B ground stations. ITT will build, install, and maintain the nationwide network. The FAA will pay "subscription charges" to ITT, just as the agency today buys telecom services from telecommunications companies. Ray Grimes, N8RG, is an FAA Commercial rated pilot and the OCSD Aero Squadron Reserve Unit Captain.

May 4th Drill Scenario: Hazardous Spills

Those attending the January 28th City/County RACES & MOU meeting chose "Hazardous Spills" as the scenario for the next countywide drill to be held on May 4, 2013, from 9:00 AM to 11:00 AM. City and County RACES and MOU units are urged to begin preparing drill messages to cover this scenario, including resources needed and conditions resulting from gas leaks, train derailments, chemical-plant accidents, etc. Countywide occurrences could be caused by widespread terrorism. For this drill as well as for future activations, we recommend using the modified "outgoing" and "incoming" ICS-213 message forms that may be downloaded from the Seal Beach/Los Alamitos RACES Web site at http://lsfyc.org/races41.lsfyc.org/Forms.htm, or from the OCRACES Web site at http://www.ocraces.org/.

RACES Serves at Tet Parade in Westminster

Westminster RACES members, with help from County of Orange RACES and the Santa Ana Response Team (SART), assisted the Westminster Police Department on Sunday, February 10, 2013, at the Year of the Snake's Tet Parade. Westminster RACES Radio Officer Chi Nguyen, KE6MVS, said ham communications went smoothly, and no interference or any other issue was reported. Other participating Westminster RACES members included Adam Valek, N6HVC, Antonio Zelaya, AF6II, Andrew Nguyen, KI6SYJ, Chu Nguyen, KE6YSS, Crystal Nguyen, KI6SYK, Joshep Pham, AB6TK, and Thu Chu, KE6SFF. OCRACES Member John Bedford, KF6PRN, assisted, as well as SART Members Gordon West,

Communicators at the Tet Parade included Westminster RACES Members (left to right, in yellow jackets/vests) Adam Valek, N6HVC, Crystal Nguyen, KI6SYK, and (back row) SART Members Jim Walthen, WA6QWJ (left), and Gordon West, WB6NOA (right), and OCRACES Member John Bedford, KF6PRN (center).

WB6NOA, Suzy West, N6GLF, and Jim Walthen, WA6QWJ. Gordon helped to program the event frequency into two radios before the event started, and then operated from the farthest post to the command-post van. Almost all RACES personnel arrived at the command post before 6:30 AM for the briefing. Everyone was deployed to their posts at about 8:00 AM. The last message to net control was at 12:04 PM.

Westminster RACES Radio Officer Chi Nguyen, KE6MVS, plots Tet Parade communications posts.

Icom Introduces IC-7100 HF/VHF/UHF Radio

Icom America has introduced the IC-7100 mobile HF/VHF/UHF transceiver. The control head features a large, multifunction, "touch-screen" dot-matrix controller display that is also a control portal to feature settings and menus. It is designed for an optimal view angle for the LCD as well the spacing for large fingers, a large internal speaker, a CW key-jack, and connectors for phone/speaker, microphone, and control cable. The control head also includes a multifunction meter and an SWR graphic display. RF power output is 100 W (HF, 6 meters, and 2 meters) and 35 W (430 MHz). Extended receive covers 30 kHz to 199.999 MHz and 400-470 MHz. The IC-7100 provides D-STAR digital voice and low-speed data communications. Dual 32-bit floating-point DSP chips support many digital processing features such as digital IF filter, twin passband tuning, manual notch filters, and RF speech compression. A built-in SD card slot provides for voice storage and data cloning. Also featured is a built-in RTTY demodulator and decoder, 505 memory channels, voice recording and playback functions, and ±0.5 ppm frequency stability. RS-BA1 IP-control remote control software is optionally available. The price will be announced after Icom receives FCC approval to sell the radio.

Kenan Reilly, KR6J, Moving to San Diego

Congratulations to Kenan Reilly, KR6J, who has accepted a position with the County of San Diego as a telecommunications technician. This is the kind of job he was looking for, and we are very happy for him. However, we hate to lose Kenan. Since he became an OCRACES member on May 5, 2010, he has been a great asset to our unit and a great friend to all of us. Kenan was quick and eager to participate in our activations, drills, and meetings, and spent a great deal of time in improving our capabilities (including lots of work in our EOC RACES Room and professionally installing our new antennas on the EOC roof). He enjoyed sharing his RF communications knowledge with everyone. Kenan also served as an OCSD PSR. We wish all the best to Kenan and his lovely wife Poay, as well as their handsome baby son Gavin.

Kenan (KR6J) and Poay Reilly.

OCRACES Welcomes Fran Needham, KJ6UJS

OCRACES is pleased to welcome Fran Needham, KJ6UJS, as its newest member. He obtained his Technician Class amateur license about a year ago and acquired a Yaesu FT-60 HT last May. He says his next radio will be a mobile. Fran became a member of SART (Santa Ana Response Team) last August through CERT, and has now switched his membership to OCRACES. He will continue to offer his assistance to SART as an OCRACES liaison, as well as to COAR and other nearby RACES units. His prime interest in amateur radio is emergency communications and community service. He is also intrigued with long-distance communications while traveling in rural areas.

Fran worked as a chemist, formulating plastics for commercial applications, ablative coatings for launch-pad applications, and sound-dampening materials for submarines. He was an engineer at Lockheed Aircraft and Douglas/McDonnell Astronautics. After leaving the aerospace industry, he sold test and manufacturing equipment regionally and nationally for wire harnesses, PCBs (thru-hole and surface-mount), coil winding, and relays.

Fran Needham, KJ6UJS, and his wife Sharon (left) and daughter Mona

Watching the Web
Web Sites of Interest to RACES Personnel

HF Digital Voice for Radio Amateurs
http://freedv.org/

FreeDV

This Web site features FreeDV, a GUI application for Windows and Linux (MacOS and BSD are in testing), which allows any SSB radio to be used for low-bit-rate digital voice. Speech is compressed down to 1400 b/s, then modulated onto a 1100-Hz-wide QPSK signal that is sent to the microphone input of an SSB radio. On receive, the signal is received by the SSB radio, then demodulated and decoded by FreeDV. FreeDV was built by an international team of radio amateurs working together on coding, design, user interface, and testing. FreeDV is open-source software, released under the GNU Public License version 2.1. The FDMDV modem and Codec2 speech codec used in FreeDV are also open source. The Web site includes a video (Windows version) of a FreeDV QSO between N4DVR in Tampa, Florida, and KØPVX in St. Louis, Missouri, using Codec2 driving a 50-watt SSB transceiver. When switching between analog SSB and digital voice, the waterfall display shows that the SSB bandwidth is about three times that of the digital signal.

To configure a digital-voice station, you will need an SSB transceiver, FreeDV software (which can be downloaded from this Web site), a Windows or Linux PC with two sound cards (or one card for receive-only), and cables to connect your PC to your SSB radio. Several start-up guides are available on the Web site.

A useful frequency on 20 meters for digital voice communications is 14.236 MHz.

The FreeDV design includes:

♦ Codec2 voice codec and FDMDV modem
♦ 50-baud 14 QPSK voice data
♦ One center BPSK carrier with 2× power for fast and robust synchronization
♦ 1.125 kHz spectrum bandwidth (half SSB) with 75 Hz carrier spacing
♦ 1400 b/s data rate with 1375 b/s open-source Codec2 voice coding and 25 b/s text for call-sign ID
♦ No interleaving in time or FEC philosophy, resulting in low latency, fast synchronization, and quick recovery from fades
♦ 44.1 or 48 kHz sample rate, sound card compatible

Key features include:

♦ Cross platform; runs on Linux or Windows (ports underway for MacOS and FreeBSD)
♦ Open-source, patent-free codec and modem that anyone can experiment with and modify
♦ Waterfall, spectrum, scatter, and audio oscilloscope displays
♦ Adjustable squelch
♦ Fast/slow SNR estimation
♦ Microphone and speaker signal audio equalizer
♦ Control of transmitter PTT via RS-232 levels
♦ Works with one (receive only) or two (transmit and receive) sound cards; for example, use a built-in sound card and USB headphones

Red Cross Holds "Meet & Greet" for RACES

American Red Cross hosted a Disaster Services Technology (DST) hands-on training on February 5, 2013, at its Orange County Chapter office in Santa Ana. The course instructors were sent from the Red Cross national office in Washington, DC. All of the technology equipment (radios, computers, satellite systems, IP phones, etc.—about 50 cases of hardware) needed to run a major disaster relief operation was shipped from the Red Cross national warehouse in Austin, TX. Class participants learned all of the steps of administering the DST activity on a major Red Cross operation. Although the training was limited to Red Cross volunteers, a separate "Meet & Greet" event was held for RACES/ACS and MOU members, to enable them to see the national DST hardware, meet the staff of the national DST team, and hear more about the Red Cross training and deployment opportunities available through the national DST program.

RACES/MOU News from Around the County

Buena Park RACES

Cpl. Andy Luong, PIO, Buena Park Police Department, is the City's RACES Program Coordinator. Anthony Santangelo, K1ACS, is the Chief Radio Officer.

La Palma RACES

La Palma Police Cpl. Les Parsons, KJ6JBS, the City's RACES Program Coordinator, announces that La Palma RACES is hosting a Ham Radio Technician license class on Saturday, March 16 (8:30 AM to 2:30 PM), Saturday, March 23 (8:30 AM to 2:30 PM), and Saturday, March 30 (8:30 AM to 1:30 PM), 2013, at La Palma Central Park, Fan Palm Room, 7821 Walker Street, in La Palma (between Orangethorpe and La Palma). The FCC examination will be held on Wednesday, April 3, 2013, at 7:00 PM. There is no cost for the class. However, each student must obtain their own copy of Gordon West's *Technician Class License Manual*, available for $20.95 at Ham Radio Outlet, 933 N. Euclid Street, in Anaheim, or on-line from W5YI, http://www.w5yi.org/catalog_details.php?pid=69. To attend, you must register—seating is limited. When you register, you will receive by return e-mail a copy of the pre-class study Q&A and an information sheet about ham radio equipment. The pre-class Q&A must be completed before class. To register, contact Bill Burbridge, W6VKO, LDS Emergency Response Team, w6vko@arrl.net.

Laguna Woods RACES

James Riedel, K6EEE, is now a Laguna Woods RACES Assistant Radio Officer. The other ARO is Ernie Senser, W6ETS. The Radio Officer is Art Welch, K7TX. The City's RACES Program Coordinator is City Manager Leslie Keane.

Los Alamitos RACES

Mike Quesada, KJ6PCA, is now the Los Alamitos RACES Assistant Radio Officer. The Chief Radio Officer is Michael Peer, WD6CDN. The City's RACES Program Coordinator is Cassandra Palmer.

Newport Beach RACES

Congratulations to Peter Putnam, NI6E, who has accepted the position of Director of Communications for the Newport Beach CERT program.

Placentia RACES

Placentia RACES Radio Officer Mark Garrett, KG6CAV, has been appointed "President" of the unit.

Santa Ana Response Team (SART)

Sgt. Brian Sheldon, Santa Ana Police Department, is now the City's RACES Program Coordinator.

Hospital Disaster Support Communications System (HDSCS)

At 7:30 AM on January 9, 2013, HDSCS was activated by Children's Hospital of Orange County (CHOC) due to telephone problems. Dial tone was intermittent and incoming calls were not being received. Seven HDSCS communicators were immediately deployed in response. As the first two were arriving at CHOC, about 35 minutes after being called, service was being restored. In accordance with HDSCS procedures, they remained until full service was restored and stable for 30 minutes. This was the first time communicators had been in the newly relocated telephone center, which is in the basement of the newest patient tower. No amateur radio antenna has as yet been installed, but the incoming hams were well prepared. By setting up their own crossband repeater in the parking lot, they were able to establish communications to the external base station and between critical hospital locations. Communicating from the hospital were Glen Lowe, KJ6YTN, and Ken Simpson, W6KOS. Other activated communicators were Cindy Orrico, W6WGA, Joe Orrico, WB6HRO, and Fred Wagner, KQ6Q. Net Controls and outside base stations providing support were April Moell, WA6OPS, and Joe Moell, KØOV.

March 2013

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4 *OCRACES Meeting* & *Weekly ACS Net*	5 *Introduction to SEMS, NIMS, EOC Orientation*	6	7	8	9
10	11 *Weekly ACS Net*	12	13 *Management Section Training*	14	15	16
17	18 *Weekly ACS Net*	19	20	21	22	23
24	25 *Weekly ACS Net* & *SWACS Frequency/ Radio Test*	26	27	28 *Plotter/ Messenger/ Hotline Course*	29	30
31						

Upcoming Events:

- **Mar 4:** OCRACES Meeting, 1930, 840 N. Eckhoff Street, Suite 104, Orange
- **Mar 5:** "Introduction to SEMS, NIMS, EOC Orientation" Course, 1000-1200, OC EOC
- **Mar 13:** "Management Section Training" Course, 1000-1200, OC EOC
- **Mar 25:** SWACS Frequency/Radio Test, 2015
- **Mar 28:** "Plotter, Messenger, and Hotline" Course, 1330-1600, OC EOC
- **Apr 13-14:** Baker to Las Vegas Challenge Cup Relay
- **May 4:** City/County RACES & MOU Drill, 0900-1100
- **May 11:** American Red Cross/ Orange County MayDay
- **May 20:** City/County RACES & MOU Meeting, 1915, 840 N. Eckhoff Street, Suite 104, Orange
- **Jun 22-23:** Field Day, Craig Park

www.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

10 m: 29.640 MHz output, 29.540 MHz input, 107.2 Hz PL (off the air)
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: 147.480 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: 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)
23 cm: Off the air until reprogrammed to new coordinated frequencies

*Primary Net—Mondays, 1900 hours

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Harvey Packard, KM6BV
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Assistant Radio Officers (Sergeants)
Jack Barth, AB6VC
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"W6ACS …
Serving
Orange County"

Meet your County of Orange RACES Members!

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KC6MMF

Harvey Packard
KM6BV

Ralph Sbragia
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