

W6VIO Calling



Jet Propulsion Laboratory Amateur Radio Club
PO Box 842, La Canada CA 91012-0842

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Upcoming Events:

- **Emergency Communications Net:** Every Monday at Noon, on WR6JPL 224.08/(-)/156.7 & 445.20/(-)/103.5, or WR6AZN 223.96/(-)/156.7 on Table Mountain.
- **JPLARC Regular Membership meeting:** Second working Friday every month from Noon to 1pm in 180-703C. Call-in: 818-354-4044 ID-number: **997 183 539** (without the spaces). Slides (if any) broadcast via JPL WebEx (same ID-number). Next is **July 17th**. **Guest speaker: Vaughn Cable K6ZTA discussing DX for the Beginner.**
- **JPLARC Board of Directors (BOD) meeting:** Normally, the first working Friday, every month, from Noon to 1pm in 180-703C. Next is **July 31st and August 14th**. Call-in: 818-354-4044 ID-number: **997 183 539** (without the spaces).

In this issue:

Topics in this issue:

- Regular meeting June 19th.
- Field Day 2015 Recap.
- BOD meeting: None - July 3rd was a JPL holiday.
- Way past time to renew for 2015.
- ARRL Membership.
- Equipment for sale.
- Future membership meetings & speaker topics.
- Advertisements.

Regular Meeting May22nd

By Jim Marr AA6QI

Present were: Eric Archer[†] N6CV, Vaughn Cable[†] K6ZTA, Bob Dengler[†] NO6B, Simon Flores KK6URT, Jim Lux W6RMK, Steve Noland[†] WA6KLC, Jennifer Platt KB3ZGK, Mike Tope W4EF, Nasrat Raouf[†] K1NAR, Steve Townes^{†*} WB4ILW, Umut Yildiz[†] KK6TJJ. On the Phone: Chuck Baker^{†*} WB6CWI, Chris Carson^{†*} KE6ABQ, Jim Marr^{†*} AA6QI, Walt Mushagian[†] K6DNS, Chuck Sarture^{†*} KG6NF, Rob Smith^{†*} W6GRV.

Note: † indicates a 2015 regular voting member (i.e., JPL/Caltech/Retired & 2015 dues paid), and * Indicates a BOD member. For a regular meeting quorum, the JPLARC Bylaws require a majority of the BOD (four or more) and at least five other regular members. We had all six BOD members, seven other regular members and

four non-members (total of seventeen attendees), so we **did** have a quorum.

President Steve Townes opened the meeting with introductions around the room. Steve then reminded us that special event station K3M in Mars, PA, will be on tomorrow afternoon on 14.275 MHz, plus or minus [ed, Steve was able to hear K3M but unable to work him due to poor propagation conditions].

Treasurer's Report: As of May 2015, no new activity, treasury balance remains \$4,784.19.

Field Day 2015: Mike Tope W4EF described the plans for the JPLARC & CITARC to provide the CW station for the joint Field Day effort with the Pasadena Radio Club at the Art Center College of Design on June 27th & 28th, and solicited further assistance with setup, operation, and take down.

New Shack: Chris Carson KE6ABQ reported that the hardline for the runs from the new shack to the antennas on the Mesa has been ordered. Steve Townes has started looking at how to coordinate the move from our current shack in building 173 to the new shack.

Guest Speaker: Jim Lux W6RMK (Figure-1): "How a Simple Radar Can Save Lives." The FINDER project developed here at JPL is an example of a simple radar that can detect heartbeats of people buried in rubble that actually saved some lives following the recent Nepal earthquake.



Figure 1: Jim Lux W6RMK

FINDER is a CW homodyne radar, which means that the LO (local oscillator) is at the same frequency as the RF (i.e., a direct conversion receiver). In a transceiver, this usually means that the transmitter is used as the LO for the receiver and the close-in phase noise of the transmitter cancels out as long as the target is not too far away (so the return signal is still coherent with the LO). These types of transceivers (Figure-2) are very popular for several types of applications: Motion detectors, door openers, police speed guns, and gunplexers.

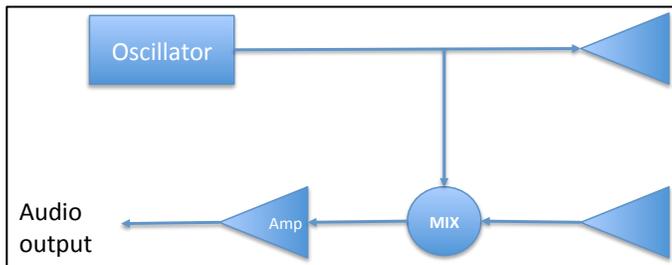


Figure 2: Homodyne transceiver block diagram.

Typically there is only one antenna and a circulator to separate the received signal from the transmitted signal. After mixing, the residual signal is DC filtered, leaving only the AC part of the signal, which is frequency shifted (Doppler shifted) by any motion of the reflecting object. For example, a police speed gun just adds a frequency counter to measure the frequency of the resulting AC signal, say at X-band the frequency shift is 66 Hz/mph then a 10mph vehicle would cause a 660Hz signal.

Jim showed a few pictures of some homodyne radars, some of which are available on ebay at very low cost,

i.e., like the HB100 microwave sensor that is used for opening doors and stuff like that.

Jim also showed a stereo Doppler microwave intruder detector that he bought a pair of at a surplus store for \$10, got rid of the electronics and built a new circuit board to interface it to his PC. It had a Gunn diode in the waveguide and a couple of detector diodes also in the waveguide but a little further towards the antenna. Jim showed some results from hooking his detector up to his laptop and running the return signal through both a PC spectrograph program and Matlab, showing the signatures of some people walking by, in which you could see their approach and departure, plus the effects of their individual leg motion.

The intruder detector diodes are at different positions in the waveguide, providing in-phase (I) and quadrature (Q) signals (with the Q signal being 90 degrees out of phase with the I signal), giving you the ability to distinguish motion towards or away from you.

All of these work with very low power. FINDER uses about 10mW and at a few tens of feet you still get reasonably high return signal-to-noise ratios.

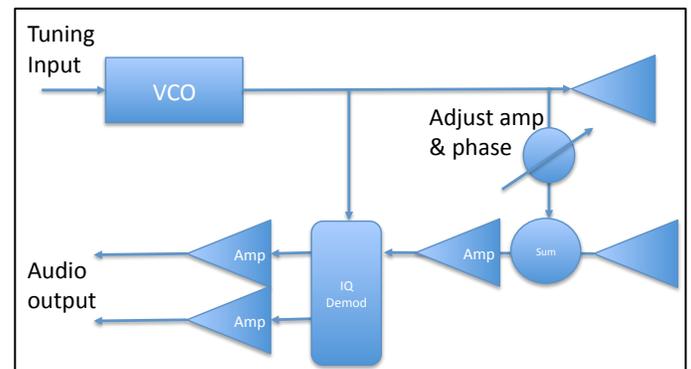


Figure 3: A fancier version.

A fancier version is shown in Figure-3. The VCO (voltage controlled oscillator) allows you to vary the frequency, giving you the ability to measure the range to the target. This version also provides the ability to mix some of the transmit signal with the reflection return signal, providing the ability to cancel out the large return signal resulting from fixed clutter, leaving only the small signals from things like breathing or heartbeats. This is what is in FINDER.

For heartbeat detection, FINDER's processor uses rules that define "what is human" and "what is not human", e.g., heart rate between 40 and 130 beats per minute, respiration rate, etc. FINDER divides range into range "bins" and processes the data for each bin separately. This processing can run in real-time on an android phone, so it's not that software intensive.

Jim then spent some discussing parts from FINDER, some examples of which he also passed around the room.

The above discussion has left out a whole lot of the interesting details that Jim covered during his talk. To learn more, contact Jim.

Finally, Jim suggested that, for those of us who want to build a radar, there are several options. Greg Charvat (now at MIT) has a mini-course on building a SAR (synthetic aperture radar) using about \$500 in mini-circuit parts and using a laptop for data acquisition and signal processing. You can also buy an HB100 module or you could cobble up your own.

Thanks to Jim for a really interesting and stimulating discussion.

Field Day 2015 Recap

By Jim Marr AA6QI

Field Day 2015 took place over the weekend of June 27th & 28th. The JPLARC joined with the Pasadena Radio Club (PRC) and the Caltech ARC (CITARC) again this year at the Art Center College of Design south parking lot on Lita Street, just across the 210 from JPL.



Figure 4: Field Day 2015 group photo taken at 11am Sunday morning (end of op's and start of teardown, so many who participated earlier missed the photo op).

We operated class 6A (six transmitters on non-commercial power) under the PRC W6KA call sign, as we did last year. There were phone stations on 75m/10m, 40m, and 20m; one CW station operating on 80m, 40m, 20m, 15m and 10m; a satellite station; and a VHF station handling NTS traffic.

The JPLARC and CITARC provided the CW station again this year. Setup began at 7am on Saturday the 27th with the goal of being ready to operate by the nominal start of operations at 11am, a goal that we achieved. Operation was for 24 hours, ending Sunday at 11am, after which we took everything down.

A couple of weekends before Field Day, several folk helped Mike Tope W4EF prepare the CITARC antenna

trailer (including repairing the Force 12 C3S triband antenna which had been damaged when the trailer was moved by CIT Facilities personnel sometime during the prior year). Those who helped Mike included: Dave Hodge N6AN, Paul Gordon N6LL, Walt Mushagian K6DNS, Jorge Gonzales KI6BJB and Jim Marr AA6QI.

We had good turnout for setup and takedown. The setup and takedown teams included: Mike Tope W4EF, David Hodge N6AN, Steve Townes WB4ILW, Walt Mushagian K6DNS, Jim Marr AA6QI, Michele Marr KC6FSP, Tommi Chatila KK6LEY, Nasrat Raouf K1NAR, Bill Weber N6CI and Dick Wetzell KA6JPZ. Setup and takedown were pretty busy so if I missed listing anyone who participated, I apologize.



Figure 5: Field Day 2015 site in the Art Center south parking lot. CW antennas and CW tent (with blue top) are in the foreground. Other Field Day stations are further in the background.

Ray Overman KJ6NO from the PRC provided the Windows laptop with the N3FJP Field Day logging program installed and pre-configured for us per my request. All stations operated the N3FJP software in standalone mode this year so we avoided the network problems we had last year.

We had operators for the CW station for the full 24-hours of contest operations beginning right on time at

11am Saturday. CW operators included: David Hodge N6AN, Merv MacMedan N6NO, Vaughn Cable K6ZTA, Harry Brumer K7IB, Mike Tope W4EF, and Jim Marr AA6QI.



Figure 6: Mike Tope W4EF on CW during the night.

Raw scores included 1807 total contacts, consisting of 1078 CW contacts and 729 phone contacts. Final scores should be available around October/November.

The Saturday evening potluck dinner and Sunday morning pancake breakfast were delicious and nobody left hungry! Some of this was even enjoyed by a raccoon who visited us in the wee hours of the morning to check out our trash bags.

Thanks to all who contributed to a really outstanding Field Day event.

Finally, some things to think about for Field Day 2016:

(1) Our generators are very old and VERY noisy compared to the newer Honda EU2000i's that PRC uses. It would be worth considering purchasing one for the Club to use at next year's Field Day.

(2) PRC folks also have outboard motor fuel tanks that they hook up to the gas fill cap on the EU2000i's so that they can keep running throughout Field Day without having to stop and refill the generator. Purchasing one of these from a marine store might also be worth considering.

(3) We found again this year that the MFJ-731 Antenna Analyzer Filter is a necessity when measuring antenna SWR using the CAA-500 Antenna Analyzer in the high RF environment at the Art Center site. We have one in 173 next to the CAA-500 but forgot to bring it to Field Day so we used AA6QI's and it worked great and allowed us to measure the SWR of our antennas with the CAA-500.

(4) The N3FJP Field Day logging software crashed a half a dozen times during the 24 hours of operation, requiring a reboot of the computer each time but, since we were not networked, we didn't lose any data, just

had to take a few unplanned breaks from logging QSOs. Might be worth discussing this with N3FJP (via the PRC).

(5) The computer's function keys were used to generate most needed CW messages via the N3FJP software driving a WKUSB electronic keyer. The text sent by these function keys continued to evolve throughout the 24-hour operation period as we gained more experience with them. We might want to have a discussion about these before FD2016.

(6) We had audio speakers hooked up so that visitors could experience the CW exchanges without having to put on earphones, which worked well. Mike Tope tried to set up a laptop running fldgi to display decoded CW but that didn't work well enough so we ended up not using it. Perhaps we could work on that this year so we could give it another try next year.

(7) Properly adjusting the ALC on the FT-1000D this year allowed us to operate CW on 40m along with the 40m SSB station without interfering with it like we did last year (see the article about this in the July 2014 issue of W6VIO Calling available at <http://jplarc.ampr.org>).

(8) We used a music stand light attached to the laptop screen to illuminate the keyboard, which worked much better than having a light to the side (although we also had a small battery powered lantern next to the radio to illuminate the radio's controls).

(9) Bigger fans are better. Although we had three small fans, Mike Tope brought in a much bigger fan that was way more effective at keeping the operator cool during the daytime.

Other than that, everything worked well.

Way Past Time to Renew for 2015

By Jim Marr AA6QI

The JPLARC Bylaws (<http://jplarc.ampr.org/Bylaws-2014.pdf>) specifies annual membership renewals are due **by the end of January** each year.

Membership renewal consists of filling in the membership application form (<http://jplarc.ampr.org/applic.pdf>) and submitting the form along with your annual dues to our Club Secretary, Rob Smith W6GRV.

Note that the Board voted to increase the annual dues to \$20 for members but left family members at \$5 as before. This is the first dues increase since January 1991.

Recall that the liability waiver on the back of the membership application form does NOT need to be signed by active JPL or JPL Contractor employees. All others need to sign the waiver.

Also recall that newly licensed members do not pay dues for the first year of club membership (but do need to submit the membership application).

ARRL Membership:

By Jim Marr AA6QI

As an ARRL affiliated club, at least 51% of our membership must be ARRL members.

As of June 1, 2015, of our 43 CY2015 members, 33 (76%) are either Life (7) or Regular (25) ARRL members. Note that 76% of our 38 voting-eligible members (i.e., JPLARC Regular members) are also ARRL members.

While there are no requirements to maintain ARRL membership, there are some clear advantages to having ARRL membership. Some of these are:

- Receiving the monthly QST magazine and having access to all back issues electronically.
- Being able to subscribe to weekly ARRL news, propagation forecasts, and satellite ephemeris notifications.
- Being able to subscribe to the electronic monthly Amateur Radio Emergency Service (ARES) newsletter that may be of interest to members who wish to stay current on emergency communications.
- Member discounts on materials and training. For example, the ARRL Introduction to Emergency Communication Course is \$85 for non-members but only \$50 for members.
- You support ARRL, the only significant amateur radio advocacy organization in the U.S. that is fighting to protect our access to the airwaves.

Should those of you who are not already members and may wish to join, please do so through the Club rather than joining directly through ARRL. Why? If you join through the Club (new members), the Club retains \$15 of your membership fee to support Club activities. From your point of view, the amount you pay is the same either way. Even if you are a member who is just renewing, doing so through the Club nets the Club \$2, again without changing your costs at all.

To renew through the Club, see Secretary Rob Smith who will help you with the paperwork (don't worry, it's really simple!).

Thanks in advance for considering joining ARRL or for maintaining your membership.

Equipment For Sale

By Jim Marr AA6QI

The sale of the following items of surplus JPLARC equipment was approved by the quorum present at the

October 24 2014 regular membership meeting. Please make your best offer to Club Treasurer Chuck Sarture at JPL. All equipment is sold as-is with a receipt from the JPLARC.

- ICOM IC-27H 25W 2m FM transceiver, asking \$40.
- Kenwood TR-9130 all-mode 25W 2m transceiver, asking \$60.
- ICOM IC-471A all-mode 70cm 25W transceiver with external PS-30 power supply, asking \$100.
- ICOM IC-471H all-mode 70cm 75W transceiver with internal power supply, asking \$150.
- ICOM AG-35 70cm mast mounted preamp, asking \$10.
- Packet Station consisting of an MFJ-8621A 2m Data Radio with crystals for 145.01 MHz & 145.09 MHz, and an AEA PK-232 MBX TNC, asking \$15 for the pair.
- RS232 to RS422 level converter, EASY model IC456A-R2, asking \$2.

Future Meetings

By Jim Marr AA6QI

All JPLARC meetings are being held on non-RDO Friday's from Noon to 1 PM in 180-703C. Upcoming talks (subject to change, as always):

Potential topics for the rest of the year include (although not all speakers are confirmed yet and always subject to change):

August 28th: TBD.

September 25th: JEARS progress update, Will Michael KC6LOK.

October 23rd: Amateur Satellite Communications for the beginner (focus on how to get started), speaker TBD.

November 20th: HRO Burbank - gear demo, HRO's Eric Christensen K6EJC.

Advertisements:



<http://www.hamradio.com>

The Burbank HRO store may offer up to a 5% discount on some ham radio "accessories" to JPLARC members, upon presentation of a valid JPLARC membership card.