W6VIO Calling

JPL

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

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President (2016):	Jonathan Cameron, KF6RTA	4-1189	EmComm. Mgr:	Christopher Carson, KE6ABQ	3-3888
Vice President (2016):	Josh Miller, KB3UUS	4-0835	W6VIO Trustee:	Rob Smith, W6GRV	3-7937
Secretary (2016):	Chris Gaylord, W6YTB	4-5584	W6JPL Trustee:	Eric Archer, N6CV	4-7350
Treasurer (2016):	Chuck Sarture, KG6NF	4-2706	WR6JPL Trustee:	Jim Lux, W6RMK	4-2075
Director at Large (2016):	Steve Townes, WB4ILW	4-7525	WR6AZN Trustee:	Bill Wood, W6FXJ	760-256-9576
Newsletter editor:	Jim Marr, AA6QI, email: aa6qi at arrl.net (your articles for the newsletter are requested, please)				

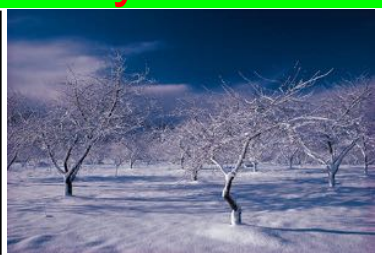
Upcoming Events:

- **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 and usually 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 January 27, 2017 (since there isn't a December regular membership meeting), guest speaker is still TBD. The 2017 club officers will assume the leadership of the club as of this meeting.**
- **JPLARC Board of Directors (BOD) meeting**: Normally, the first working Friday, every month, from Noon to 1pm and usually in 180-703C. **The next BOD meeting will be Jan 13, 2017**. Call-in: 818-354-4044 ID-number: **997 183 539** (without the spaces).
- **For more upcoming events, see the ARRL Los Angeles Section website**: http://www.areslax.org
- **JPL Retiree Nets:** Saturdays, 8:30pm on 1.990 Mhz LSB and Sundays, 2:00pm on 7.150Mhz LSB.

In this issue:

Topics in this issue:

Happy Holidays to all!



Reminder: The JPLARC Bylaws state that dues for renewing members are payable to the club secretary by January 30th each year.

Regular Membership Meeting November 18th

By Jim Marr AA6QI

Present were: Parker Abercombie KK6ZKW, Gary Block† KJ6IZX, Jonathan Cameron†* KF6RTA, Bob Cesarone WA9JIB, Dave Gumpertz† KM6FCE, Kathleen Harmon† KM6GBY, Jim Lux† W6RMK, Eric Shalov† KJ6ARC, Rob Smith† W6GRV, Lew Soloway† AC6LS, Mike Torode. Phone/JPLWebex: Chris Carson†* KE6ABQ, Jim Marr† AA6QI, Steve Noland† WA6KLC, Chuck Sarture†* KG6NF, Mike Tope† W4EF, Bill Weber N6CI.

Note: † indicates a 2016 regular voting member (i.e., JPL/Caltech/Retiree and 2016 dues paid), †† indicates an associate (non-voting) member, and * Indicates a 2016 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 3 BOD members, eleven other regular members and three non-members (total of 17 attendees), so we **did not** have a quorum (didn't have four or more Board members).

Jim Lux W6RMK announced that there were several candidates for offices who were currently on vacation so we were unable to hold voice voting at this meeting (besides that we didn't have a quorum). Jim will contact these individuals next week and will send out a ballot to all voting members per the JPLARC Bylaws (http://jplarc.ampr.org/Bylaws-2014.pdf).

Guest Speakers: Jim Marr AA6QI led a discussion on "Fixing HF RFI (Radio Frequency Interference) in B310 and B329."

The high noise level in B310 was first noticed after an Alpha Delta DXCC fan dipole antenna (80m through 10m) was installed on the roof of B310 on February 7, 2014 (Figure 1) and one of the JPLARC 's transceivers (an FT-1000D) was moved into 310-106. Noise levels of S9+30dB were observed on 80m and S9+20dB were observed on 40m, basically making these two bands useless for EmComm. The DXCC antenna has about 200 feet of RG213 coax running from the antenna, through a lighting arrestor mounted to the B310 tower and through a standpipe down to 310-106. Later the FT-1000D transceiver was swapped out for the club's Kenwood TS-850SAT so that the FT-1000D could be used for Field Day.

Figure 1: B310 tower showing the club's DXCC fan dipole set up as an inverted V and the club's CX-333 VHF/UHF antenna

On September 14, 2014, Jan Tarsala WB6VRN, Steve Townes WB4ILW and Jim Marr AA6QI attempted to track down the source of the noise using their Kenwood TH-F6 HTs in AM mode along with a portable spectrum analyzer. They found that noise levels consistent with what was being seen on the transceivers in 310-106 was present on just about every conductor on the roof of B310. The noise source(s) appeared to be local to B310 since it (they) weren't present at B179 by the east gate or at 180-R6.

Following installation of the Cushcraft R-7000 vertical antenna at the club's new shack, B329, Steve Townes reported relatively high noise levels there, as well.

The club will also likely need to deal with noise induced into the new Mesa HF antenna farm due to the long runs of coax and control cables between B329 and the Mesa.

In July 2016, Jim Marr attended a talk at the Pasadena Radio Club (PRC) given by Bob Brehm AK6R, owner and chief engineer of Palomar Engineers, the talk being titled "ABCs of RFI for Hams." You can see this presentation at http://palomar-engineers.com under "speaker presentations" way down on the left hand side of the opening page. This talk was a good discussion of RFI in general, with a lot of practical approaches to addressing them using Palomar Engineers' products. We tried to get Bob to come to JPL to give his talk but were unsuccessful.

Since hearing Bob's presentation I have been reading a lot about HF RFI, thinking about how to address the B310 and B329 noise issues. A couple of the best references that I've found (via Google searches) are: (1) "***A Ham's Guide to RFI, Ferrites, Baluns and Audio Interfacing***" by Jim Brown K9YC (66 pages); and (2) "***Locating RF Interference at HF***" by Tom Thompson W0IVJ in the November 2014 QST (7 pages). Also, the Fair-Rite Products Corp (fair-rite.com) has a huge amount of information about ferrites and papers describing how to apply ferrites, targeting application engineers who will be applying the company's ferrite products.

Tom Tompson's paper describes how to build and use tracking loop antennas to locate sources of HF but since B310 noise is so localized to that building, these techniques are not likely to be useful to us. They would be useful for tracking down power line arcing, grow bulb or other similar sources of noise in your neighborhoods.

Jim Marr presented a few slides taken from Bob Brehm's PRC presentation that were applicable to the issue of a ham receiver as the RFI victim. Bob listed, on his slide 10, a bunch of potential sources of RFI, the paths that this RFI might take in order to reach the ham receiver, and solutions: eliminate the source or choke the path. Since B310 is the primary emergency response building for JPL, it is unlikely that we can shut off power long enough to isolate the source of the B310 RFI. This leaves us with the option of choking the path that the noise is taking in order to reach the HF receiver in 310.

Most hams know that when feeding a balanced antenna (e.g. a dipole) with an unbalanced feedline (e.g. coax) that if there is any unbalance caused by structures near either side of the dipole or a feedline that isn't absolutely perpendicular to the antenna, there will be currents flowing on the outside of the coax that will affect the radiation pattern of the antenna. It must also be kept in mind that any common mode currents induced onto the cable by other sources, will pass onto the antenna and can produce the noise that we see in the ham receiver.

Bob's PRC presentation slide 12 shows plots of choking impedance vs frequency for ferrite cores made from the popular ferrite mixes used by hams: mixes 31, 43, 61 and 77. Looking at these curves, one might think that using mix 77 (with single-turn, single-core resonance at about 8 MHz) might be the core of choice for addressing noise in the 80m and 40m bands, but this isn't the case. As you add turns through the core and more cores, the added capacitance lowers the resonance frequency of the resulting choke. This results in mix 31 being the mix of choice for these frequencies.

Palomar Engineers (PE) makes a coax feed line common mode noise filter (CMNF-1; $60) that is intended for insertion into the feedline directly at the transceiver input, providing about 4k ohms of impedance at 80m and 40m, ~3k ohms of impedance at 20m and decreasing above that.

PE also makes feedline chokes made up of stings of ferrite beads (up to 15 beads) on a straight section RG213 coax that PE intends to be inserted near the antenna feedpoint. The 15-bead version provides about 1.6k ohms of choking impedance at 40m but only about 1k ohms of choking impedance at 80m.

PE also recommends that the power cord of the station transceiver be wrapped with as many turns as will fit into a 2.4 inch OD mix 31 ferrite core to provide suppression of any signal that might be coming in from the building power grid.

Moving on to Jim Brown's 66 page paper "***A Ham's Guide to RFI, Ferrites, Baluns and Audio Interfacing***"… Jim recommends designing common mode chokes for greater than 5k ohms of impedance. In his paper, he provides a recommendation for chokes to suppress 80m & 40m noise, these consisting of: (1) six, 5" diameter turns of RG-8 through five 2.4" O.D. mix 31 cores or (2) five, 5" diameter turns through seven 2.4" mix 31 cores, with a "turn" consisting of the number of times that the coax passes through the cores and the turns being spaced widely apart as opposed to being bunched together (e.g. Figure 2). Either of these will provide about 6k ohms at both 80m and 40m. In his paper, Jim provides plots showing the impedance of various combinations of turns and cores versus frequency to help you make decisions.

PE makes what they call a "Super Choker" (part number SC-160-40), consisting of 5 turns through five 2.4" mix 31 cores. The 5 turns are tied together with zip ties and, due to the additional capacitance from the bunched turns, results in a resonant frequency much lower than Jim Brown's curves for 5 turns through 5 cores using widely spaced turns. The result is the PE's Super Choker has about 5.5k ohms at 80m but only about 2k ohms at 40m due to the lower resonance frequency of this PE configuration.

PE also provides just a five-core stack of 2.4" mix 31 toroids (for $55) that would allow you to add your own number of turns. This is a bit more expensive than just buying five individual 2.4" mix 31 cores from PE at $10/each.

Figure 2: A choke consisting of 5-turns through five 2.4" O.D. mix 31 ferrite cores from Jim Brown's paper.

Figure 3: DC power cord wound onto a 2.4" O.D. mix 31 ferrite core.

Back to the B310 HF noise… My best guess is that the RF noise is being capacitively coupled as common mode to the 200′ of coax running from the antenna to 310-106

from the many other cables that are sharing the conduit with our coax. Since we currently do not have an adequate choke at the antenna feedpoint, this noise can flow onto the antenna and be conducted down to the transceiver in 310-106.

It is possible that the noise is coupling into the transceiver from the coax directly at the transceiver or from the transceiver's power supply. Also possible is that some noise is being routed into 310-106 via the VHF/UHF coax that connects the Kenwood TM-642 in 310-106 to the Comet CX-333 triband antenna that is also mounted on top of the B310 roof-mounted tower. My feeling is that these other modes are less likely than the coupling directly to the coax and then to the antenna due to inadequate choking at the antenna feedpoint, so we should start attacking the noise issue there.

I recommended three options for addressing the common mode noise suppression approach, all of which boiled down to providing a >5k ohm choke at the antenna feed point, a >5k ohm choke at the transceiver in 310-106, and winding the transceiver power cord through a single 2.4" mix 31 core as close to the TM-850SAT transceiver as possible (Figure 3) in order to suppress any common mode that might be entering from the building's AC power distribution system. Each of these three options would cost about $130 +tax + shipping.

Jim Lux W6RMK offered to provide twelve 2.4" mix 31 toroidal ferrite cores that he already has for us to build the chokes needed to test whether or not this approach to suppressing the common mode noise in 310-106 will work. Jim agreed to provide the cores to Jonathan Cameron who will deliver them to Jim Marr so that Jim can assemble the needed chokes. Then a work party will be scheduled to install them at B310-106 and test their effectiveness.

Should this approach work well, we could implement the same approach at B329 for the R-7000 vertical. Then, as progress is made toward completing the connections the Mesa HF antennas, we will need to decide what choke approach to take for the coax and rotor control cables between B329 and the Mesa since they are very long and will be susceptible to the same kind of common mode noise issues.

Note that most of the figures that I presented during the presentation are available either in the PE PRC presentation or in Jim Brown's 66 page paper and are detailed enough that they will not reproduce well in the compressed .pdf format that we post to the jplarc.ampr.org web site. If you would like a copy of the presentation, send an email to aa6qi@arrl.net and I will be happy to forward a .pdf copy to you.

BOD Meeting Dec 2nd

By Jim Marr AA6QI

Present were: Gary Block† KJ6IZS, Jonathan Cameron†* KF6RTA, Chris Gaylord†* W6YTB, Josh Miller†* KB3UUS, Stan Sander† N6MP, Mike Torode. On the Phone: Chris Carson†* KE6ABQ, Jim Marr† AA6QI, Chuck Sarture†* KG6NF.

Note: † indicates a 2016 regular voting member (i.e., JPL/Caltech/Retiree & 2016 dues paid), †† indicates an associate (non-voting) member, and * Indicates a 2016 BOD member. For a BOD meeting quorum, the JPLARC Bylaws require a majority of the BOD (four or more) to be present. We had five BOD members present (plus three other regular members and one non-member) so we **did** have a quorum.

President Jonathan Cameron chaired the meeting.

2017 Officer Elections: Jonathan said that Jim Lux W6RMK plans to mail out the ballot to voting members soon, which must be returned within 10 days for votes to count. Officer candidates for 2017 are: President: Jonathan Cameron KF6RTA; Vice President: Josh Miller KB3UUS; Secretary: Matt Bennett KF6RTB; Treasurer: Chuck Sarture KG6NF, so the only change from 2016 would be Matt for Secretary. Appointed positions: Jonathan indicated that he would plan to appoint Chris Gaylord W6YTB as Emergency Communications Manager and would want Steve Townes WB4ILW to continue as Director at Large if he is willing.

Treasurer's Report: Treasurer Chuck Sarture KG6NF presented the current budget status: Previous balance of $4,420.75; Income of $20.00 from one new member and $15 in commission from a new ARRL membership; $678.00 for BOD approved mesh network equipment; Ending balance $3,777.75.

The additional mesh network equipment approved to establish a Mt. Wilson receive-only link for the 224.08/445.20 machines, that was approved at the previous BOD meeting, has been partially purchased and Jonathan Cameron expects that it will all be purchased before the end of the year. Some question remains as to where the tie-in to the existing mesh network will be located (a couple of options were discussed).

Membership Report: Secretary Chris Gaylord reported that there was no change in membership this last month, remaining at 58 total members, of which 47 are voting members and 68% are ARRL members.

Chris Gaylord also said that last week he updated the JPLARC club listing on the ARRL website with the above year-end membership numbers.

There was a brief discussion about the possibility of a

Bylaws change next year to allow some prorating of membership dues for those that join later in the year. [ed. While the Bylaws state that dues are "payable no later than January 30th to the club treasurer," getting some members to pay their dues by then has sometimes been a challenge. These late payers should be considered when designing any prorating, perhaps such as limiting any prorating to those who are new to the club (i.e., not former members).]

Guest speaker program update: Josh Miller has yet to line up a guest speaker for the January regular membership meeting.

Josh thanked Jim Marr for his list of all guest speakers/topics given at regular membership meetings since presentations were restarted in 2013. Also included in that list were a couple of topics that club members had previously indicated that they would like to hear a speaker address. Additional topics suggested during this BOD meeting included: (1) Station backup power systems; (2) Remote JPLARC HF capability. We also need to check the situation with Patrick Stoddard WD9EWK regarding his AMSAT-Future talk that we had to defer earlier this year.

If there are topics that you are interested in or something that you would like to give a talk on, please contact Josh Miller KB3UUS or Matt Bennett KF6RTB.

Mesh Network Update: The club now has permanent MESH capability on the Mesa, on building 180 and in building 329 (our new shack). The JPLARC now owns all of this equipment and, as such, the node names have been updated (from what was published last month) to reflect this change in ownership.

On the Mesa:

- **W6JPL-M5R-MESA** via a Ubiqity Rocket M5. Has a 120°, 19 dBi sector antenna providing coverage to the greater Pasadena area. Channel 171, 10 MHz channel width at 5.855 GHz, with SSID AREDN.

- **W6JPL-M5NS-XW-MESA** via a Ubiquity NanoStation M5. Has a 41°, ~15 dBi sector antenna providing a wireless link from the Mesa nodes down to 180-R6. Channel 168, 10 MHz channel width (5.840 GHz), SSID AREDN.

On building 180 (roof near R6):

- **W6JPL-M5R-180R6** via a Ubiquity Rocket M5. Has a 120°, 16 dBi sector antenna providing mesh access for the JPL campus. Channel 174, 20 MHz channel width (5.870 GHz), SSID AREDN.

- **W6JPL-M3NS-180R6** via a Ubiquity NanoStation M3 with reflector. Provides 3 GHz point-to-point link to the Orange County mesh network on Pleasants Peak. 3.420 GHz 10 MHz channel width, SSID AREDN.

- **W6JPL-M5NS-180R6** via a Ubiquiti NanoStation M5. Has a 41°, ~15 dBi sector antenna providing a wireless link from 180-R6 up to the JPL Mesa. Channel 168, 10 MHz channel width (5.840 GHz), SSID AREDN.

At building 329:

- **W6JPL-M5NSL-XW-B329** via a Ubiquiti NanoStation M5. Links to our shack from W6JPL-M5R-180R6 with 115+ mbps. We also now have 2 VOIP phones in B329.

Mesh Node Trustee:

- Eric Archer N6CV, the club's W6JPL call sign Trustee, has agreed to be the trustee of the JPL mesh nodes that are all identified with the W6JPL call sign in their node names.

- Jonathan Cameron will work with Eric to coordinate how to control the mesh nodes. Currently, disabling or rebooting the mesh nodes requires a visit to the Mesa, 180-R6 or B329.

B329 Patch Panel: Jonathan Cameron fabricated and installed an 8-connector patch panel (bar) in the east-facing cabinet in B329. Figure-4 shows the patch panel with the Cushcraft R-7000 connection to the Yaesu FT-1000D through the bottom connector.

Figure 4: New patch panel (strip) in B329.

Since there are four new hard lines going to the base of the Rohn tower and two new hard lines going to the base of the water-tank tower, there will be one additional spare connector.

Cables are going to be procured to connect the B329 hard line terminations (located in the cabinet just to the south of B329) to the new patch panel.

Labels also need to be installed for each antenna and radio cable(s).

Using the patch panel requires connecting the specific radio coax cable to the desired antenna.

HF RF Noise Mitigation: Based on discussions at the last regular meeting, Jim Marr took fifteen 2.4" mix-31 ferrite cores that Jim Lux provided and built three common-mode chokes (Figure 5) that are to be used to test the possibility that the very high 80m & 40m noise levels in B310 and somewhat high noise levels in B329

might be due to coax common-mode currents. The idea is to put one of these chokes at the B310 DXCC antenna feed point, one at the Kenwood TS-850SAT transceiver in 310-106, and one at the Yeasu FT-1000D transceiver in B329.

Since the Cushcraft R-7000 vertical on the roof of B329 already has a current mode choke (9 turns on two unknown-mix cores) in the matching network box at the base of the antenna, one probably shouldn't be required at the antenna end, although it isn't clear what the blocking impedance of the R-7000 choke at 40m actually is (note that the R-7000 doesn't cover 80m), so it might actually be worth a test of installing one at the antenna end just to see if makes any difference.

Figure 5: Three common-mode chokes aimed at reducing 80m & 40m noise levels in B310 and B329.

Jonathan Cameron obtained two additional large mix-31 clamp-on ferrites from Jan Tarsala WB6VRN to put on the transceiver power cords.

The Board also approved giving Jim a 100 ft roll of RG-8 coax in exchange for his RG-8 coax, connectors, connector-adaptors, shrink tubing and zip ties that he used in constructing the three chokes.

Monday Noon-Net Check-ins: We continue to have 20-to-25 check-ins each week.

JPLARC Committees: The Board had a brief discussion regarding the updating of the JPLARC Organization Chart that is presented at each Board meeting, most of the discussion being about the various committees.

The Bylaws list the standing committees of the club. While the Bylaws don't say much about what the roles of the committees are, these roles were listed on page 9 of the February 2014 issue of W6VIO Calling, available at the club website: jplarc.ampr.org.

[ed., For reference, the descriptions of the roles of the various club committees, taken from that Feb 2014 issue, are:

*The eight **standing committees** listed in the Bylaws are: Education; Publicity; Repeater; Station Facility; Emergency Communications; Internet Services; Field Day and Nominating.*

***Other committees** are: Club bulletin; Meeting programs; Public/special events; Refreshments; Historian; Holiday banquet.*

The following is a brief description of what these committees are envisioned to do in order to help those considering volunteering for one or more of these committees to get some idea of what they might be doing there.

***Education Committee (standing)**: Provides leadership coordinating club training, including licensing training and exams. Volunteer Examiner credentials are a plus for this committee but not necessary. We keep hoping to get some classes and exams for JPL'ers going each year.*

***Publicity Committee (standing)**: Provides a focus for outreach and JPL awareness.*

***Repeater Committee (standing)**: Leads the operation, maintenance, and improvement of the club's several repeater systems.*

***Station Facility Committee (standing)**: Leads the operation, maintenance and improvement of the club's non-repeater capabilities (HF, VHF, UHF, Satellite, Digital, Mesh, etc.).*

***Emergency Communications Committee (standing)**: Leads the coordination with the JPL Emergency Amateur Radio Service (JEARS) that is run by JPL's Protective Services organization. JEARS is envisioned to be modeled after the ARRL Amateur Radio Emergency Service (ARES) with JPL as the 'served agency'.*

***Internet Service Committee (standing)**: This committee leads the clubs internet presence. This presence includes JPL maintained websites, the jplarc.ampr.org web pages, the jplarc email reflector, and a location for storing presentation materials (formerly the jplarc wiki that is currently off-line). These services are closely coordinated with the WR6JPL IRLP/Echolink node running on the same computers.*

***Field Day Committee (standing)**: Lead the preparations for the club's annual Field Day (FD) participation in June of each year. While FD comes only once per year, preparation and afterword activities take much of the year.*

***Nominating Committee (standing)**: Recruits nominees for the four elected club officer positions each year and presents them at the November regular membership meeting.*

***Club Bulletin Committee (other)**: Leads the preparation and distribution of the monthly W6VIO Calling club newsletter.*

***Meeting Programs Committee (other)**: Arranges for guest speakers at each of the club's monthly regular membership meetings. This committee reports to the club Vice President.*

***Public/Special Events Committee (other)**: Coordinates the club's participation in public service events (races, parades, etc.) or special events (significant JPL events like Mars landings that are likely to be widely known by the public, where we put a special event station on the air). We haven't done any of these in a while and it would be good to get some going again, especially after the Mesa HF antennas are restored to operation.*

***Refreshments Committee (other)**: Provides refreshments for meetings or special events at the direction of the Board of Directors.*

***Historian (other)**: Maintains club records and occasionally provides articles of historical significance for the club newsletter.*

***Holiday Banquet (other)**: Coordinates the (formerly) annual holiday banquet and awards ceremony, which used to occur in December each year but which has not happened for quite a while now due to other club priorities.*

Please consider volunteering your support to one or more of these committees. Just let any club officer know of your interest and they'll get you in touch with others interested in that committee. Thanks in advance.]

New Newsletter Editor Needed: Jim Marr, the newsletter editor since 2013, has requested that the 2017 Board recruit a new newsletter editor. This person works closely with the club's Secretary. Jim will help get the new editor up to speed, just as Bill Wood W6FXJ did for Jim when he started.

Other nets/clubs: (1) *JPL Retiree nets*: (a) 160m net: Saturdays 8:30pm-9:30pm on 1.990MHz LSB, and (b) 40m net: Sundays 2:00pm to whenever on 7.185MHz LSB; (2) *Pasadena Radio Club*, meets 4th Tuesday of every month at the Kaiser facility in Pasadena. See w6ka.net; (3) The *ALERT net* meets Mondays at 8pm on the W6MPH repeater (145.18, -, 156.7), followed by a simplex net on 147.480 MHz (ALTA1).

JEARS

By Chris Gaylord W6YTB

JEARS Participation Invitation:

Club members who work on-Lab and are interested in providing communications support during emergency situations are encouraged to join the JPL Emergency Amateur Radio Service (JEARS), a volunteer team co-sponsored by the Club and the PSD Emergency & Continuity Management Group (203A).

Prospective JEARS members must be currently licensed (any class) and complete the FEMA IS-100, IS-200, IS-700 & IS-800 courses. An online application and links to the courses are available at http://goto/jears (only accessible from on-Lab). Emergency credentials and additional training will be provided by 203A after joining.

For more information, please contact Chris Gaylord W6YTB at christopher.gaylord@jpl.nasa.gov or (818) 354-5584.

ARRL Membership:

By Jim Marr AA6QI

As an ARRL affiliated club, we need to maintain at least 51% ARRL membership among our voting 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 Chris Gaylord 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.

Future Meetings

By Jim Marr AA6QI

All JPLARC meetings are being held on working (i.e. non-RDO) Friday's from Noon to 1 PM in 180-703C (unless otherwise indicated). The BOD meets on the first

working Friday each month and the regular membership meeting is held on the second working Friday of each month. When there is a third working Friday in a month, the Board can decide whether or not to hold an additional BOD meeting on that third working Friday.

Upcoming regular membership meeting talks (always subject to change):

January 27th: Guest speaker TBD. 2017 Officers assume duties.

February 24th: Guest speaker TBD.

March 24th: Guest speaker TBD.

2016 JPLARC Organization: