

# PAARAgraphs



The Official Newsletter of the  
**Palo Alto Amateur Radio Association, Inc.**

The Friendliest Club Around

Celebrating 86 years as an *active* amateur radio club—Since 1937

<http://www.paara.org/>



## Antenna Potpourri Steve Stearns, K6OIK

**Abstract:** Cats feature in some famous explanations of radio. Examples are given. Antenna Q has multiple definitions. A fundamental definition of Q is given. One kind of formula for Q is shown to be wrong. Chu's famous 1948 result on antenna Q is revisited and shown to be correct but incomplete. A correction is given that generalizes Chu. Finally a comparison of HF dipoles versus verticals versus horizontal and vertical loops over ground shows which is better and why. No, it's not just a matter of pattern shape or noise polarization.

**Speaker bio:** Steve Stearns, K6OIK, started in ham radio while in high school at the height of the Heath-kit era. He holds FCC Amateur Extra and a commercial General Radio Operator license with Radar endorsement. He previously held Novice, Technician, and 1st Class Radiotelephone licenses. He studied electrical engineering at California State University Fullerton, the University of Southern California, and Stanford, specializing in electromagnetics, communication engineering and signal processing. Steve worked at Northrop Grumman Corporation's Electromagnetic Systems Laboratory in San Jose, California. He retired as Northrop Grumman Technical Fellow. Steve is serving as vice-president of the Foothills Amateur Radio Society, and served previously as assistant director of ARRL Pacific Division. He has over 100 professional publications and presentations and ten patents. Steve's Amateur Radio presentations are archived at [fars.k6ya.org/docs/k6oik](https://fars.k6ya.org/docs/k6oik), and his professional papers are at IEEE Xplore. Steve has received numerous awards for professional and community volunteer activities.

## This meeting will be a Hybrid Meeting Zoom and In Person

Time: July 7, 2023 07:00 PM Pacific Time  
Please check <https://www.paara.org> for  
Zoom Details

## Upcoming Events

July 7*** Aug 4 Sept 1	PAARA General Meeting, 7:00 PM *** Zoom and In Person Meeting
July 19 Aug 16 Sept 20	Board Meeting, 7:00 PM. Everyone welcome! Zoom Meeting, eMail President for details!



## President's Corner

July 2023

Wow! What a fun weekend June 23rd~25th, Field Day, turned out to be. Aside from the weather, rather cool and windy, everyone I talked to had a wonderful time. Thanks to the support of many members, we had 2 HF stations and a GO-TA station in full operation for most of the 24-hour operating period. A huge shout-out goes to Doug, KG6LWE, for coordinating the event and putting in lots of time to make it happen both before the event and during the event. Next are all the members who participated in one or more of the 4 antenna parties. There were several new members who came to help get the antennas ready and learn about large amateur radio antennas.



A BIG thank you goes to Rob, KC6TYD, for arriving at Bedwell early and getting the mowing crew to mow our area before they knocked it off for the weekend! Setup for FD started at ~11

(Pres — Continued on page 4)

### How a Young Ham Almost Revolutionized AM Rich Stiebel, W6APZ

A young ham decided to come to the United States to get an engineering degree. I had the pleasure of meeting Ami Arber (SK), 4X4AN, when we both worked at Knight-Kit Electronics, a division of Allied Radio, in Chicago. Knight-Kit's principal rival was Heath-Kit. Both companies made electronics kits for hams, test equipment, entertainment tuners and amplifiers.

RCA came to Knight Electronics with an "experimental" tube that would do all the things advertised in the amateur bands; i.e., it would do more but cost less. It was the latest and greatest tube for ham radio. Ami was assigned to use that tube to design the T-400 Transmitter Kit. This kit would put out 400 Watts on AM, 600 Watts PEP on SSB and cover 80 through 6 meters. See Figure A.. The kit was almost ready when RCA announced that they were NOT going into production with this wonderful tube.



years-ahead *knight-kit* amateur gear

T-400 AMATEUR 400-WATT TRANSMITTER KIT

Y-7160  
**\$395.00**  
 400-Watt CW  
 Transmitter

Truly the "dream" transmitter—has what it takes to punch out a QRM-busting SSB, AM, or CW signal. 600 watts P.E.P. input on SSB; 400 watts on AM and CW. Covers 80, 40, 20, 10, and 15 or 6 meter bands. Start with the basic CW kit—then add AM and SSB accessory units and other "add-ins" whenever you wish. Has heterodyne VFO to assure a signal which "stays put." Tremendous

Fig. A — Knight Kit T-400

### Amplitude Modulation

Based on my successful design of several Citizen's Band Knight-Kits, I was added to the design team, which involved using the tried-and-true 4X150A tube. This required an extensive redesign of the final and the drive circuits, which Ami accomplished. In the process he realized how much of the transmitter was due to the AM and decided that there had to be a better way to

accomplish amplitude modulation.

In the early 1960s, the first transmitter that many hams bought was a kit for CW consisting of a 6AG7 driving a 6L6 final. The Heathkit AT-1 Transmitter shown in Figure B is typical of what



Fig. B — Heathkit AT-1

was available to hams. Getting on Amplitude Modulation (AM) required an audio amplifier of power comparable to the RF output of the transmitter. This increased the price of the transmitter considerably, so many hams started out with CW. Morse Code was part of the ham radio test in those days, so every ham knew CW.

The ham literature discussed the possibility of adding AM to a CW transmitter by modulating the Screen Grid voltage. While this worked, it did not produce the same high-power AM attainable with plate modulation. Ami realized that screen modulation simply varied the screen voltage slightly in response to the audio signal. What was needed was a way to completely shut off the RF output tube and then drive this tube to full power.

On his own time, Ami developed what he cleverly called: "The Series Gate Modulator" to differentiate it from screen grid modulation. Using this modulator, he was able to attain 100% modulation with the Heath-Kit AT-1 CW transmitter and similar CW rigs. Any ham rig using a power tetrode in the final could benefit from Ami's modulator.

At the time, I was running a Heathkit DX-100,



Fig. C — Heathkit DX-100

100 Watt AM/CW transmitter. See Figure C. Ami asked me to hook up his Series Gate Modulator to the DX-100 and check the results. I got 100% modulation from the pair of 6146 tubes in the final, and the receiving station could not tell the difference when I switched from the internal AM to the external Series Gate Modulator. This helped verify that Ami had a winning design. Ami was sure this would revolutionize Amplitude Modulation.

**How did the Series Gate Modulator work?**

Figure D shows full-page ad for the M-100 Modulator containing some of the features. Looking at the schematic (Figure E), one can see that a pair of EF86 tubes are used as audio amplifiers driving a 12BH7, the actual series gate modulator. The first EF86 had a feedback network that could be switched in to make the V-1 oscillate at 1000 Hz. This permitted setting R-6, the modulation control, to obtain 100% modulation. The carrier level is set by R-13, which adjusts the bias on the cathode of V-3A. This schematic also shows that the screen grid of the transmitter could be driven to minus 140 V DC to com-

M-100

**WILL OUTPERFORM  
ANY AM MODULATION  
SYSTEM**

**GREATEST DEVELOPMENT IN AM MODULATION**

**FEATURES:**

- Most economic and efficient AM modulation ever designed.
- Modulates FULLY any beam tetrode amplifier and LINEAR amplifier up to 1 KW.
- Excellent waveform and modulation linearity.
- Controlled automatic speech clipping.
- Complete elimination of negative and positive peaks overmodulation.
- Compact, small in size, VERY LOW power consumption, IDEAL for mobile use.
- The ONLY modulation system that permits operation of full CW ratings.
- Built-in 1000 cps tone generator.
- Adjustable carrier level.
- Provisions for single, parallel, and push-pull final amplifier tubes.

**We** are proud to be the first to introduce a self-contained, quality modulator unit which incorporates a unique method of modulation that, though originated in the United States, has already achieved great popularity in Europe and currently is gaining its due place in this country.

Much simplified version of this powerful modulation has found a limited use in some commercial and amateur equipment, but this is the first time that the full potentials of the series gate modulation have been completely utilized.

The most important requirements in communication are readability and intelligibility; the M-100 was designed with these important aspects in mind. Also it enables the transmitter to give a big punch of reserved power at the moments when you most need it: When you talk. With series gate modulation, the no-talk power input is negligible while the talk power at peaks can reach almost twice as much power input as in full plate modulation.

**CONVERTS MOST COMMERCIAL CW TRANSMITTERS AND  
LINEAR AMPLIFIERS INTO A FIRST CLASS PHONE RIG  
WITHOUT SACRIFICING CW POWER CAPACITY**

**ELECTROTONE LABORATORIES**  
 CUSTOM SOUND SYSTEMS AND AUDIO DEVICES

Fig. D — Full Page Advertisement

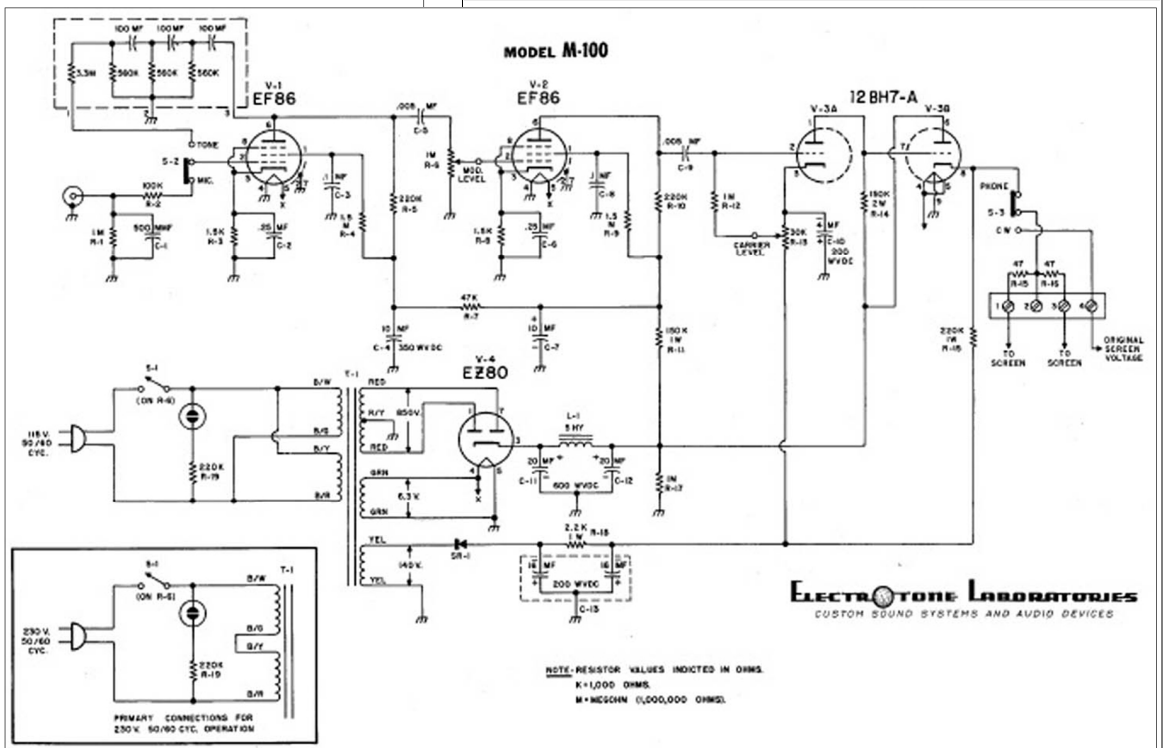


Fig. E — M-100 Schematic

pletely cut off the RF-output tube. To use the transmitter in the CW mode, S-3 switched the screen grid to its normal voltage. Of course, the

*(Revolutionized AM — Continued on page 4)*

(Revolutionized AM — Continued from page 3)

AC input to the M-100 could be wired for 115 or 230 VAC to enable the unit to be used either in the US or overseas.

Ami called his company Electrotone Laboratories. He advertised that this inexpensive M-100 modulator would convert most commercial CW transmitters and linear amplifiers into first-class phone rigs without sacrificing their CW power capacity. Any beam tetrode amplifier up to 1 KW could be modulated with this unit. Talk power peaks would reach almost twice as much power input as in full plate modulation, with very little power consumed by the modulator. Fresh from his success in modulating these various rigs, Ami wanted to make his invention known to the world, so he sent an ad to QST which politely but forcefully rejected his ad as not being possible. Ami knew he was right, so he sent the ARRL laboratory one of his Series Gate Modulators to try out. This resulted in an apology from ARRL and running of his ad. This ad ran for several months: see Figure F of the August, QST, page 151.

**Model M-100 NEW SELF-CONTAINED UNIVERSAL SERIES GATE A.M. MODULATOR**  
**BECAUSE OF THE BIG DEMAND: NOW AVAILABLE IN KIT FORM!!!**  
**EASILY ADAPTABLE TO MOST COMMERCIAL CW TRANSMITTERS**  
**AN IDEAL MODULATOR FOR THE BOMBEREW TRANSMITTER**

- Modulates any beam tetrode or pentode amplifier up to 1 KW
- Extremely economical and efficient method of modulation
- No sacrifice in CW power capacity
- Amazingly small: only 6" x 7 1/2" x 5 1/2"
- Two years complete guarantee

Find out for yourself why the M-100 is your best ham investment per dollar. Kit.....\$29.95 Net  
 Wired and tested..... 39.95 Net  
 10 DAYS TRIAL, MONEY BACK GUARANTEE

Write for complete technical information. Send check or money order to:

**ELECTROTONE LABORATORIES** 2717 North Ashland Avenue,  
 Chicago 14, Illinois

Fig. F — M-100 QST Advertisement

Ami continued his electronic business, but unfortunately, the Series Gate Modulator did not make the big revolution in ham radio expected by all. Though his modulator worked as described, Single Side Band was slowly gaining popularity in the ham world, and most hams saved their money to invest in SSB, which was becoming popular in the 1960's, rather than this new method of Amplitude Modulation.

(Pres — Continued from page 1)

AM on Friday. Several of the antenna party volunteers and a few other members gathered at "Radio Point" where we set up the tower trailer and the large 4-element 40M antenna. The initial setup was complete in about 2 hours in time for lunch. Set up then commenced on the KT34XA on the military tower. Many of the participants in setting up this tower hadn't experienced how it goes together thus we now have

some new members who can set it up. After completing the initial setup for this antenna, it was time to retrieve the U-Haul trucks and pack it up for the day. Frank, AF6XX, and Joe, WB6JOE, brought their trailers out to spend the night, work some HF and watch the site.

The final elevation of the military mast, elevating it from its nested elevation to 50', started at about 9:30 AM on Saturday along with the station captains, Harry, K4YR, Ric, N6AJS, Christopher, AI6KG, and Joe, WB6JOE, setting up the radios in their respective trucks. Due to a technical issue, we weren't on the air until about 11:30 AM, a shoutout goes to Ian Teter for his help in resolving the issue, but once on the air we were off and running. The setup team then shifted to setting up Doug's Buddy Pole Hex Beam antenna for the GOTA station. The setup of this antenna turned into an educational event for many people who had never seen or set one up. During the final setup of the antennas, Rob, KC6TYD, was busy setting up the food area. He did a masterful job of providing everyone with drinks and food throughout the entire event starting on Friday during the initial setup of the antennas. Make sure to thank him if you enjoyed any of the food or drinks, he provided.

PAARA was visited by several notable people. The first was Jeff Norris, KA6UIX, Emergency Management Coordinator for San Mateo County who also lent a hand in obtaining the use permit for Bedwell Bayfront Park. James Armstrong, NV6W, Santa Clara Section Manager, Jeff Gee, Redwood City Mayor, and Kristen McIntyre, K6WX, Pacific Division Director. A BIG thanks go to all of them for taking the time to pay us a visit and in some cases earn us bonus points. Thanks also go to Bob, KD6KYT, for contacting Jeff and getting him to visit us.

As for the bands, by and large, they were favorable. But as atmospheric conditions change, so did the bands. For the most part, the phone station was on 20M almost all of the time. That band was HOT until about 1:30 AM! More than once, we commanded a frequency and had sizable pileups for the operators and loggers to manage. A couple of the pileups lasted several hours! What a fun time that was for those in the seat!

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(Pres — Continued from page 4)

The cast iron seat award goes to Ted Niemira, W6SY, who worked CW for about 7 hours straight through the night! As usual, that BIG 40M antenna we put onto the tower trailer dominated the night and well into Sunday morning. Though a challenge to assemble and get into the air, it has been well worth the effort every year it's been deployed.

Though every year is different, there usually is something notable that wasn't predicted in the planning. This year was no different. Without a doubt, it was the number of younger hams that came out to participate. Not only did they come to learn how to operate HF but learn about and assist in setting up antennas. Notable participants included Anya, KN6VAC, George, KN6YGW, Catherine, KN6YGD, and Leo, Margaret, K6WEK's, son who is studying to take the test in the near future. All spent some time behind the microphone dipping their toes into the ocean. Of note, Anya spent the most time behind the microphone and took to it like a seasoned contester. She graduated from the GOTA station to managing pileups at the SSB station! More than one person commented that she's a natural contester.



The above picture is of the people who stuck it out until the very end of loading out the site on Sunday. Many of them were also there for one or more antenna parties and for setting up on Friday and Saturday. A big THANKS go out to them and others who assisted in another wonderful PAARA event! L to R, Clark, KK6ISP, Harry, K4YR, Leo, Bob, KN6YGN, Darryl, KI6LDM, Frank, AF6XX, Margaret, K6WEK, Doug, KG6LWE, and Ric, N6AJS. As of this writing, the points haven't been totaled. Hopefully, we'll have the totals by the July 7th club

meeting which will be an in-person as well as a Zoom meeting.

Next on the docket, will be the PAARA tour of Hiller Air Museum on August 19th. If you haven't been, it's a very interesting aviation museum that's right in our neck of the woods. The \$10 entrance fee will be the best money you could spend learning about the Bay Area's history of helicopters and other aircraft. You can learn about the museum at: <https://www.hiller.org/>. We also have the opportunity to have lunch at the Sky Kitchen Restaurant at the San Carlos Airport. The lunch is optional and not covered by the entrance fee to the museum. More information will be presented at the July 7th meeting.

The next event will be another PAARA in the Park. Darryl, KI6LDM, obtained the permit to use Memorial Park in Cupertino on September 30. That said, please mark your calendars for another great day of socializing, getting on the air, and learning about ham radio. Darryl is looking for another antenna build project like the one we had at the last PAARA in the Park. If you have an idea on an antenna that can be built in an hour or two that others would be interested in, let Darryl know.

Let us not forget that October 20 ~ 22 is Pacificon and the PAARA special event station. You can register for the event at <https://www.pacificon.org/>. Please reach out to Mikko to lend your hand in setting up or operating the station.

I look forward to seeing a room full of smiling faces at the July 7th meeting. It will be an IRL and Zoom meeting.

73, Jim K6SV

Get on the air to keep the airwaves alive!

### June 2023 Board Meeting Minutes

Present were President Jim Thielemann K6SV, Vice President Rob Fenn KC6TYD, Secretary Ric Hulett N6AJS, and Directors Doug Teter KG6LWE, Walt Gyger K6WGY, Joel Wilhite KD6W, and Darryl Presley KI6LWM. A quorum was present.

The meeting was called to order at 7:10 p.m.

**President's Report:** Welcome, Summer! To-

(Minutes — Continued on page 6)

*(Minutes — Continued from page 5)*

day is the longest day of the year. Thanks to the participants in the four Field Day antenna work days: We got the 40 meter antenna tuned and tested last Saturday. We will start the FD setup at Bedwell Park Friday morning June 23, at 10:00 am.

**Secretary's Report:** Members, please note: You can receive your PAARAgaphs in color, as a convenient e-mail attachment. Send an e-mail to N6AJS@arrl.net if you want to start an electronic subscription.

The Secretary will update the membership roster on the PAARA website.

**VP / Program Chair Report:** The next PAARA meeting is July 7. Our speaker will be Steve Stearns K6OIK. He will speak on 'Antenna Pot-pourri' and the 'fundamental definition of Q'. We anticipate a fascinating technical presentation.

We have leads for August and September presentations.

### **Old Business**

**Field Day Planning:** The trailer has been checked and maintained, and all antennas are loaded for transport.

Generators have been checked and fueled.

T-shirts will be delivered before Saturday. KC6TYD is to be congratulated on the fine FD t-shirt design.

Mowing the field has not yet started.

We will have an access key by Friday.

The Visitor log is printed and ready, public information material has been gathered.

Rob KC6TYD will bring sandwich makings and other food items.

**Safety:** Rob KC6TYD is the safety captain. In raising the tubular towers, it is important we have a single boss for the tower lift. Also, that we signal clearly 'brake on' and 'brake off' actions. Anyone on the crew can call 'STOP' at any time.

**PAARAgaphs articles:** While we have member-written stories for July and possibly August, we need more! PAARA members, contribute to

your club and your newsletter: Write an article or ham-related (or unrelated) story, even a short one. Send it to our intrepid editor, Jim K6SV.

**Treasury:** Our accountant has the books up to date.

**New members and new hams, please take note:** The club has an IC-7300 HF rig available for members to borrow. It comes with power supply, microphone, and assistance in selecting an HF antenna. This is a no-risk way to dip your toes into HF Ham Radio! Contact Ric, N6AJS (N6AJS@arrl.net) or Doug, KG6LWE (dteter@wcbi.com) to find out more.

**PAARA Advertising:** The report will be ready by then end of July.

**PAARA 900 MHz Repeater:** We need to schedule a work day at the repeater site to deal with downed timber and weed mitigation, sometime after Field Day.

**Reminder to the Webmaster:** We need to update the back-issues of PAARAgaphs on the PAARA web site.

**Local Club Links:** Need to complete updating the links to other local clubs on the website. N6AJS will complete this in time for the August newsletter.

**Members:** Mark your calendars!

We have a PAARA field trip to the Hiller Aviation Museum, scheduled for August 19th. The cost is \$10 per person.

We will hold another "PAARA in the Park" event, September 30.

Pacificon is only four months away, on October 20 through 22. PAARA will support the W1AW/6 station, as in past years.

Bob, KN6YGN volunteered for meeting refreshments, Ric, N6AJS will serve as backup.

Idea fostering with Oklahoma Club, Darryl, w5zxc membership, club activities, etc. We'll do this later in the summer.

The meeting was adjourned at 8:45 pm.

Respectfully submitted,

Ric Hulett N6AJS  
 PAARA Secretary

**Palo Alto Amateur Radio Association, Inc.**

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 dteter@wcwi.com  
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**VE Exams**

De Anza Park, Sunnyvale, 2nd Saturday 10:30 am each month except November and December. See website for details and exceptions: <http://amateur-radio.org>

**Electronics Flea Market (ESM)**

Sponsorship: Association of Silicon Valley Amateur Radio Organizations (ASVARO)  
 The Electronics Flea Market is seeking a new location. Until that is resolved, the EFM is on hold. Website: <http://www.electronicfleamarket.com/>

**PAARA — Palo Alto Amateur Radio Association**

Meets 1<sup>st</sup> Friday 7:00pm each month at Room H-6, Cubberley Community Center; Net 145.230 - PL 100Hz Mondays at 8:30. See website at <http://www.paara.org>. For more information. contact: Joel Wilhite KD6W, [KD6W@ARRL.NET](mailto:KD6W@ARRL.NET), 650-325-8239

**FARS — Foothills Amateur Radio Society**

Meets 4<sup>th</sup> Friday each month at 7:00pm at Covington School, Los Altos. Website: <http://www.fars.k6va.org>

**NCDXC — Northern California DX Club**

Meets 3<sup>rd</sup> Thursday 7:00pm each month, Repeater for member info 147.360. Contact [president@ncdxc.org](mailto:president@ncdxc.org). Website: <http://ncdxc.org>. YouTube content: "The Northern California DX Club Official Channel". Cohost of the International DX Convention.

**The 50MHz & Up Group of Northern California**

This organization specializes in vhf + wak signal and microwave activities. Meetings are held on the first Tuesday of each month. Time is usually 5pm for in person meetings, and 7pm for Zoom only meetings. In person meetings are held Sports Basement, 1177 Kern Ave, Sunnyvale. Always check the website, <http://50MhzandUp.org>, for correct information. Zoom information is also there.

**San Mateo Radio Club W6UQ.ORG**

Meets, 3<sup>rd</sup> Friday, January through November.  
 Tuesdays & Thursdays, [Directed] Net, 7pm, N6ZX 145.370Hz, -600KHz, PL107.2Hz  
 Contact: [SanMateoRadioClub@gmail.com](mailto:SanMateoRadioClub@gmail.com), Website: <http://W6UQ.org/calendar>

**SPECS**

**Southern Peninsula Emergency Communication System users Group**

Meets each Monday 7:30pm and 8:00pm.  
 See: <https://specsnet.org/monday-night-net> for more info.  
 Contact: <https://www.specsnet.org/contact> or [board@specsnet.org](mailto:board@specsnet.org)

**SCARES**

**South County Amateur Radio Emergency Service**

Meets 3<sup>rd</sup> Thursday 7:30pm each month, Belmont EOC, Belmont City Hall, One Twin Pines Lane, Belmont CA 94002. Net is on 146.445 [PL 114.8] & 444.50 (PL-100) 7:30 Monday evenings. Contact: President Gary D. Aden, K6GDA 650-743-1265 (D), 650- 595-5590 (N)  
 Web: <http://k6mpn.org> E-mail: [pres@k6mpn.org](mailto:pres@k6mpn.org)

**SCCARA**

**Santa Clara County Amateur Radio Association**

Operates W6UU & W6UU/R, repeater 146.985-pl  
 Nets: 2m, 7:30pm Mon; 70cm, 10M (28.385) 8PM Thur.  
 Meets 2<sup>nd</sup> Mon each month @ 7:30 PM.  
 ARRL/VEC license testing contact 408-507-4698

**SVECS — Silicon Valley Emergency Communications**

Operates AA6BT repeater (146.115 MHz+)  
 Website: <http://www.svecs.net> or contact: Lou Stierer WA6QYS 408 241 7999

**WVARA — West Valley Amateur Radio Association**

W6PIY six-meter repeater on 52.58MHz. Normally, six-meters is linked with 147 and 223, while 441 and 1286 repeaters are linked.

VHF: 52.58 (-500) 151.4 ctcss                      UHF:                      441.35 (+5.0) 88.5 ctcss  
 147.39 (+600) 151.4 ctcss                      223.96 (+1.6) 156.7 ctcss                      1286.20 (-12m) 100.0 ctcss

Meetings are 2nd Wednesday of every month except July, August and December.

Website: <http://wvara.org>. Contact: [info@wvara.org](mailto:info@wvara.org)

(Please send changes to [PAARAgaphs editor](mailto:PAARAgaphs editor))



### PAARA Weekly Radio Net

Info and Swap Session  
 every Monday evening at 8:30pm  
 on the N6NFI 145.230 MHz repeater

#### Week Control Operator

1 <sup>st</sup>	Doug - KG6LWE
2 <sup>nd</sup>	Doug - KG6LWE
3 <sup>rd</sup>	Ric - N6AJS
4 <sup>th</sup>	Rob - KC6TYD
5 <sup>th</sup>	Rob - KC6TYD

If you're interested in trying out at Net Control, Contact Doug, KG6LWE. It's good practice, and lots o' fun! Give it a try.

**Cubberley Community Center**  
 4000 Middlefield Road, Palo Alto, CA 94303  
 650/329.2418  
 650/856.8756 fax  
 www.cityofpaloalto.org

**Meeting Location — Middlefield Road  
 between San Antonio and Charleston in Palo  
 Alto. 4000 Middlefield Road**

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**Email:** KARLDRESDEN@juno.com

### Palo Alto Amateur Radio Association P.O. Box 911, Menlo Park California 94026-0911

Club meetings are on the first Friday of each month,  
 7:00pm at the Room H-6, Cubberley Community Center.

Radio NET & Swap Session every Monday evening, at  
 8:30pm, on the 145.230 –600 MHz repeater, PL 100Hz.

Membership in PAARA is \$25.00 per calendar year,  
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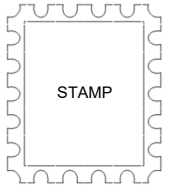
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