

P.O. Box 6421 Auburn, CA 95604

August 2014

At The Key of SFARC:

PRESIDENT Tyghe Richardson, KD6MLH tyghe@tjrauctions.com

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TREASURER Richard Kuepper, WA6RWS rkuepper@surewest.net

DIRECTORS Mark Graybill, W8BIT Robert Bell, W6RBL Jim Jupin, WA8MPA

FIELD DAY CHAIRMAN Bob Naylor, WE6C

REPORTERS Satellites: Greg, KO6TH History: Gary, KQ6RT Misc Radio: Fred, K6DGW Sunshine: Richard, WA6RWS rkuepper@surewest.net **REPEATERS** 145.430 (-0.6 MHz/PL 141.3)

440.575 (+5.0 MHz/PL 162.2) 223.860 (-1.6 MHz/PL 162.2)

CLUB NET Thursdays, 7:30PM, W6EK/R 145.430

CLUB MEETINGS Second Friday of the month, 7:30PM at the Auburn City Hall, 1215 Lincoln Way, Auburn CA

CLUB BREAKFAST Last Sat of the month at Mel's Diner 1730 Grass Valley Hwy, Auburn 7:30AM

NET CONTROL OPS Dave Jenkins, WB6RBE Norm Medland, W6AFR Bob Brodovsky, K6UDA Al Martin, NI2U

NEWSLETTER EDITOR Barbara Anderson, W6EVA 916.624.1343 anderson51@wavecable.com

WEBMASTER & ARRL PIO: Carl A Schultz, WF6J

Inside this issue:

- From the Mic
- Field Day Highlights
- Welcome New Members
- Miscellaneous Radio Vacuum Tubes
- Board & General Minutes

We encourage members to receive Sierra Signals via email to save the Club the cost of reproduction and mailing

Sierra Signals is published monthly by the Sierra Foothills Amateur Radio Club for the information of its members and friends, and is distributed via E-mail and USPS mail. Opinions expressed are those of the authors. Newsletter exchanges with other clubs via E-mail are welcomed. Contact the editor to be placed on the E-mailing list. The contents of Sierra Signals are copyrighted by the Sierra Foothills Amateur Radio Club, and all rights are reserved. That said, we will gladly permit republications for nonprofit uses of all text material. Photos require the consent of all persons pictured in them, and some of our material is copyrighted by others and published by permission. You'll need to contact them for permission.

Calendar of Events

info@w6ek.org

http://w6ek.org

August 8th: Club Meeting

August 9th & 10th: TEVIS

August 30th: Club Breakfast



From the Mic By Tyghe Richardson – KD6MLH, President

CC&R's

As a California Real Estate Broker, Auctioneer, and Realtor I routinely help clients navigate the complex process of property transfer in California. One of the things that often comes up in this process that can directly affect amateur radio operators are the Covenants Constraints and Restrictions (CC&R's) of the subject property. There is potentially some good news for us HAM's in this matter- there is currently a bill in front of the United States House of Representatives to amend the way CC&R's affect amateur radio stations. This bill is HR 4969.

HR.4969 would require the FCC, within 120 days of the Bill's passage, to amend the Part 97 Amateur Service rules to apply PRB-1 coverage to include homeowners' association regulations and deed restrictions, often referred to as "covenants, conditions, and restrictions (CC&R's)." PRB-1 states that local governments cannot preclude Amateur Radio communications; they must "reasonably accommodate" amateur operations, and the state and local regulations must be the minimum practicable regulation to accomplish a legitimate governmental interest.

Presently, PRB-1 only applies to state and local zoning laws and ordinances. Since PRB-1 was enacted, the FCC has said several times that it would prefer to have some guidance from Congress before extending the policy to private land-use regulations. HR 4969 will provide that guidance, and give PRB-1 the force of Federal law." Source http://www.change.org

I personally have seen these restrictions make such broad statements as "freestanding metal structures are prohibited." Are they referring to towers or metal buildings? Often it is hard for anybody to interpret these rules as they affect hams. According to www.change.org, if this bill passes it will suppress the unreasonable restrictions placed on amateur radio operators in areas with CC&R's.

Personally, out of all the bills presented each year I hope this one passes. If you live in an area that is affected by CC&R's I suggest you keep an eye on this bill.

73's for now, Tyghe KD6MLH

Field Day 2014

Contact number for people making over 10 Q's. A great team effort!! Dennis - WU6X

KD6MLH	265		
AE60R	101		
K6UDA	77 (GOTA)		
KF7QVB	70		
WU6X	65		
N6EMS	58		
K6BAA	51		
WE6C	45		
N6FWD	35		
N6UG	23		
K6GPB	19		
NI2U	18		
K6UVK	15		
WA6RWS14			









ARRL Field Day Entry Form

Datestamp: 2014-07-07 18:07:17 PDT Confirmation: 1776af16824149e2

Call Used: W6EK GOTA Station Call: K6UDA ARRL/RAC Section: SV Class: 4A

Participants: 40 Club/Group Name: Sierra Foothills Amateur Radio club

Power Source(s): Generator Power Multiplier: 2X

Bonus Points: 100% Emergency power 400 Media Publicity 100 Set-up in Public Place 100 Information Booth 100 NTS message to ARRL SM/SEC 100 W1AW Field Day Message 100 Site Visit by invited served agency official 100 Youth participation 40 Youth operators=2 Youth participants=2 GOTA Bonus 120 Submitted via the Web 50 Educational activity 100 Total Bonus Points 1,310

Score Summary: CW Digital Phone Total Total QSOs 209 46 748 Total Points 418 92 748 1258 Claimed Score = 2,516





Submitted by: Dennis Gregory, WU6X PO Box 6421 Auburn, CA 95604 E-mail: wu6x@hotmail.com

Comments: GOTA: Un-licensed operators are noted as call sign K6UDA

Band/Mode QSO Breakdown: CW Digital Phone QSOs Pwr(W) QSOs Pwr(W) QSOs Pwr(W) 160m 80m 145 150 40m 72 150 18 150 142 150 20m 44 150 20 150 260 150 15m 89 150 8 150 98 150 10m 6m 3 50 21 50 2m 1 50 10 50 <u>GOTA 72 150</u> TOTAL 209 46 748 GOTA Bonus: GOTA Coach - Double Bonus Points Name/Call QSOs Bonus Points Grace Lewis, K6UDA 1 0 Bob Shuken, W6USB 2 0 Garrett Lewis, K6UDA 5 0 Ruth First, K6UDA 2 0 Ray Spencer, KK6LGF 20 40 Toni Graybill, KK6JPJ 21 40 Wendy Rousch, KK6HSK 21 40

Supporting documentation for Bonus Points will be sent via mail to: Field Day, ARRL, 225 Main St., Newington, CT 06111 USA





WELCOME NEW SFARC MEMBERS

DAVIS, KK6MDH AND DEBBIE, AI6AR

MISCELLANEOUS RADIO

Vacuum Tubes You Probably Won't Find in a Ham's Junkbox

I would venture to guess that even new hams in 2014 are aware that solid-state devices have not been around since the beginning of radio and were preceded by vacuum-state devices [aka "tubes"]. I would further venture to guess that since the only vacuum-state devices we find around today are in high-power linear amplifiers, very new hams might be a little hazy on the details of how they operate.



The first tubes were diodes. They have an anode, and a cathode heated by a filament just like a light bulb. Sometimes the filament <u>is</u> the cathode. The heated cathode boils off electrons and, if the anode is positive with respect to the cathode, the electrons are attracted and a current flows. If the anode is negative, the electrons are repelled and no current flows.

At the left is the schematic symbol for a triode. It has a "control grid" of wires between cathode and anode. If the anode is positive with respect to the cathode and the control grid is at the same potential as the cathode, it works like a diode. If the control grid is negative with respect to the cathode, it repels the electrons and thus controls the magnitude of the current to the anode. A changing voltage on the control grid gets transformed into a

changing current to the anode.



Adding a second grid called a "screen grid" makes a tetrode, and modifies the tubes characteristics. Pentodes add a third "suppressor grid" to supress the secondary electrons dislodged from the anode when the primary electrons strikes it.

Today, probably the majority of high-power linear amplifiers use triodes with the control grid grounded and the input RF to the cathode. They tend to be low gain, taking possibly 100 watts of drive to get 1.5 KW out, but they are inherently stable.

Amplifiers with the cathode grounded and input to the control grid usually are tetrodes and can have higher gain and thus require less drive power. They need to be very carefully designed however because power fed back to the control grid can turn them into high powered oscillators which is almost never a good thing.

You will very likely find vacuum diodes, triodes, tetrodes, pentodes, beam-power tetrodes, and other such tubes in a random ham's junk box if he or she has been around for awhile. There are, however, vacuum-state devices very much in use today that you're not likely to find in those junk boxes, and they're our destination this month. Pretty much in all cases, they are "tubes" that operate in the UHF and microwave ranges, and at least one will generate RF in the terahertz range [1 Thz=10¹² Hz=a million Mhz and wavelengths of less than a millimeter].

Klystron: Klystrons are often used as very high-power UHF and microwave amplifiers,¹ for a long time the mainstay of UHF television transmitters.

Here's a diagram I found. The device consists of a long evacuated tube² [usually metal] with a heated cathode at one end and a water-cooled copper block collector at the other. The tube is surrounded by powerful magnets that shape the electrons into a thin beam. The anode is very close to the cathode and accelerates the electrons which then fly through a hole and down the tube.

In addition to the magnets, the tube goes through two [or more] "cavities." They are nearly always silver plated brass and they form resonant circuits at the desired frequency range.



The UHF or microwave input energy is coupled into the cavity nearest the electron gun. As the electrons pass through the

¹ Sep 2008 Misc Radio mentioned the 10 KW Eimac klystron amplifiers in the AN/MRC-98 while delving into Diversity Reception

² The AN/MRC-98 klystrons were about 5 ½ feet long and perhaps 10 inches in diameter.

gap in the cavity, the RF energy alters their velocity ever so slightly. Some are sped up a tiny bit, and then on the next halfcycle, they'll be slowed a tiny bit. The input RF is very low power, so this velocity change is very slight. The electrons then drift on down the tube toward the collector. During this time, the slower electrons get overtaken by the faster ones, and by the time they get to the second cavity, they're in dense bunches. As the bunches pass the gap in the second cavity, they induce very strong oscillations in the cavity which are coupled out as the high-power output. You can see this exact effect on the Interstate. Vehicles traveling at slightly different speeds tend to get bunched up with a low density of vehicles in between.

The Stanford Linear Accelerator [SLAC] uses high power klystrons arrayed down the beam tube to continuously accelerate the particle beams [and consume 50 - 100 MW of electricity in the process \bigcirc].

Reflex Klystron: The reflex klystron is at the opposite end of the power spectrum, and operates as a microwave oscillator ... or at least did until solid-state microwave devices came along. It has the ubiquitous cathode that emits electrons, an accelerating grid speeds them up, and a cavity. Beyond the cavity is a repeller element that repels the electrons and ultimately sends them back through the cavity. If the voltage on the repeller is adjusted so that the electron bunches go back through the cavity in-phase with the ones coming up from the cathode, the tube will act as a microwave oscillator.

The exact frequency is very sensitive to the repeller voltage, and for transmitting, the modulating signal [e.g. an NTSC TV signal] would frequency modulate the RF. This was very common in TV studio-transmitter links in mid-20th century. They were also used as local oscillators to down-convert a received microwave signal to VHF for detection.



Traveling Wave Tube: OK, you might find this in a small number of junk boxes. Often called a TWT ["twit"], these are used where very wide bandwidths are required at microwave frequencies. Since they can generate substantial power as well, hams who dabble in microwaves [such as the 10 GHz and up contest this month and in Sep] often use TWT's in the 20 - 50 watt range for transmitting. Coupled with a dish antenna with perhaps 30 dB gain at 10 GHz, they have an ERP around 20 to 50 KW and achieve some amazing distances.



Like the klystron, it starts with a heated cathode emitting electrons which are accelerated through a hole in the anode. And like the klystron, they head down a tube [glass surrounded by magnets and are eventually collected at the end of the tube.

Wound around the inside of the tube is a helix of wire, usually flat silver plated copper tape bonded to the glass. The input RF [again microwaves] connects to the end of the helix nearest the cathode, usually from waveguide, and the output connects to the other end of the helix, again usually through waveguide.

The electron beam is traveling very fast, but quite slow compared to the velocity of electromagnetic radiation [the

input RF]. However, because the RF is being conducted on the helix, it is traveling a much longer distance, around and around the tube. The result inside the tube is that the RF creates a wave that travels down the tube at just under the speed of the electrons in the beam. The interaction with that wave is to continuously feed kinetic energy from the electron beam into it, and what comes out the output port is much stronger than what went in.

TWT's exhibit a very wide bandwidth ... two octaves and sometimes more. Coupled with their ability to produce very significant power levels, they'll probably continue to stick around for the foreseeable future.

Magnetron: The magnetron probably began life when radar began moving into the microwave range early in WW2. Original radar operated in the VHF range to begin with, the radar in Hawaii' that supposedly detected the Japanese attack operated around 2 meters.

The basic magnetron consists of a thick disk of solid copper [the anode] with cavities machined into it. The diagram is looking down on the disk. The center is milled out, and contains the heated cathode. Each of the cavities connects to the center through a small machined gap. A very strong magnetic field, often from permanent magnets, goes through the disk from top to bottom [into the page in the diagram]. The disk is in a vacuum chamber.

The electrons emitted by the cathode would dash straight to the copper block in the absence of the magnetic field, and we'd just have a very substantial diode. The magnetic field, perpendicular to the path from cathode to anode causes the electrons to spiral around the cathode.

Just like blowing across the top of a soda bottle will set up acoustic standing waves in the bottle which you can hear, the dense cloud of charged electrons does an analogous thing



screaming past the gaps, and sets up electromagnetic oscillations in the cavities. The result is a whole lot of microwave power. Pulsed radars generate peak pulse powers in the megawatt range, however the pulses are very short and thus the average power is in kilowatts.

Magnetrons are the power source in microwave ovens of course, which I invented by sticking hot dogs into the feed horn to heat them, around 1959, working at the TV station. Sadly, Amana came up with a much catchier name ["Radar Range"] than my "Stick It In The Feed Horn" and I'm still waiting for the royalties.

Backward Wave Oscillators: BWO's are sort of an amalgam of a reflex klystron, TWT, and a magnetron and the details are probably best left to the HCPD.³ I'm not sure if they're all that common anymore, but there were two types: O-Type and M-Type. They both have the property of being able to generate significant amounts of RF in the terahertz range [1,000 GHz and up]. The O-Type are low power [~50 to 100 mw] and the M-Type will generate power in the KW range.

M-Type BWO's played a big role in radar jamming and electronic counter-measures in the last half of the 20th century because they can be swept over a huge frequency range at very high speeds simply by changing the accelerating voltage. It's like they're radiating everywhere. I believe that has faded some when computers and radars became coupled and the computer could figure out the sweep pattern and counteract it. BWO's used in ECM equipment are sometimes called "carcinotrons," I've seen that usage in USAF Tech Orders, but technically, that was [is?] the trade-name of one manufacturer whose name I no longer remember.

Iconoscope: This is one I could bring to a club meeting. It is one of the original TV camera tubes that captured images, and I was given this one when I graduated college and left the TV station. It is very hard to take pictures of it.⁴

We used slide and movie projectors through an optical multiplexer to project images on a photo-sensitive plate from the left. The long tubular part is an electron gun that scanned the plate and transferred the charges created by the image to the output terminals.

Because the electron guy is angled, the scan had to be compensated, or the image would have a "keystone" shape. TV stations don't use these anymore. \bigcirc

73,

Fred K6DGW



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³ Hard Core Physics Dudes

⁴ A. It is glass with lots of transparent places, and B. It is very oddly shaped and no single camera position captures all of the shape.



BOARD OF DIRECTORS MEETING MINUTES July 11, 2014

The SFARC Board meeting for July commenced at 1800 hours at Round Table Pizza in Elm Avenue shopping center in Auburn.

Roll Call: All officers and Directors were present with the exception of Board members Robert-W6RBL and Mark-W8BIT. Guests present were Al-NI2U, Birton-N6UG, Bob-K6UDA and Ben-KJ6PLV.

REPORTS and DISCUSSIONS

President's Report: Tyghe-KD6MLH, discussed the meeting agenda. A discussion on gifting one of our past members a complimentary membership for the remainder of the year for his many contributions for Field Day. No decision.

<u>VP Report:</u> Dave-NO6NO reported pricing on business card promos. A discussion followed on printing QSL cards as an alternate (suggested by K6UDA). Motion by Dave-NO6NO to print promo business cards only, USING the same design as previous, 2nd by Dennis-WU6X; discussion on how the card might be used by the membership; passed.

<u>Secretary's Report</u>: Dennis-WU6X reported on FD2014 stats and shared presentation planned for General meeting. A discussion followed.

Treasurer's Report: Richard-WA6RWS reported finances for June spending which was more than income by approximately \$100 due to Field Day expenses; net cash on hand, expenses, income and balance on hand. A discussion was held regarding other Club's newsletters, and how we might provide "links" on our website to them. Richard to discuss with Carl-PIO.

<u>Repeater</u>: Richard-WA6RWS reported the 220 repeater is now back in full operation and linked to the 2m and 440 boxers. A new PL of 110.9 has been set on the 220 receiver as an interim test to isolate noise problems.

Directors: Jim-WA8MPA reported we had the best month ever on refreshment donations.

Meeting adjourned at 1832 hours.

Submitted by Dennis Gregory - WU6X, SFARC Secretary





GENERAL MEETING MINUTES July 11, 2014



The SFARC General meeting for July commenced at 1930 hours at the Auburn City Hall Rose Room, President Tyghe-KD6MLH presiding. All Officers and Directors were present except for Robert-W6RBL and Mark-W8BIT. Tyghe led approximately 37 members and guests in a Pledge of Allegiance to the flag followed by an introduction of Officers, members and guests.

REPORTS:

<u>President's Report</u>: Tyghe called for approval of the minutes from last meeting as posted in the newsletter. A motion by Al-NI2U, 2nd by Bob-N6EMS to approve as posted passed unanimously with no corrections. Tyghe reminded the membership Tevis Cup would be using the 2m repeater on August 9th, and to try and keep it clear.

<u>VP's Report</u>: Dave-NO7NO reported T-shirts and hats still available; and a battery-operated light for anyone interested.

<u>Secretary's Report</u>: Dennis-WU6X reminded the Membership to sign the attendance sheet, and for guests and new members to pick up a Welcome letter at the break containing important information about the club.

<u>Treasurer's Report</u>: Richard-WA6RWS reported finances "in the black" as of July 1st; details available upon request.

<u>Repeater</u>: Richard-WA6RWS reported the 220 repeater now back in service, linked to both the 2m and 440 repeaters, with a PL of 110.9Khz. Richard reminded the membership of the upcoming Tevis Cup and that the 220 and 440 repeaters would be "unlinked" from the 2m repeater to allow the Tevis organization free use of 2m and the membership use of the separate 220/440 repeaters.

Sunshine Report: Richard-WA6RWS reported that Bob-W6RBL's mother passed during the week and to remember him in our thoughts and prayers, as he lost his Father shortly before. Also Jettie-W6RFF is now in an assisted living home, but welcoming visitors. The facility is in Lincoln Hills, off 12 Bridges and Hwy 65 (visiting hours 11-7pm); see Richard for details. Lastly, Dave-N6SHD not doing well and needs are our thoughts and prayers as well.

<u>Satellite Report</u>: Greg-KO6TH gave a report on the latest Lithuanian launches.

<u>VE Report</u>: Dave-NO6NO, reported VE testing results of: (12) candidates took (22) exam elements with (8) Techs, (3) General and (1) Extra passing. Bob-K6UDA reported that a poll of the people taking exams included "tinkerers", 4-wheelers and preppers, and suggested orienting support of those organizations in our marketing efforts.

<u>PIO Report</u>: Carl-WF6J reported web updates now mostly complete including many great pictures of Field Day-2014. He is still looking for an assistant in maintaining the website and would be willing to setup someone and provide training. Please contact Carl if you are interested and can assist, as this is an important function of the Club and we don't want Carl burned out.

<u>Picnic Report</u>: Jeremiah-W6DLO gave a report on planning for the Club Picnic and invited Members to sign-up so we can get a head count, and to bring a side dish. The picnic is **scheduled for July 26th - Auburn Recreational Park Noon-4pm**. For more information and to sign-up, go to the www.w6ek.org website.

<u>Refreshments/Drawing</u>: Jim-KD4BKZ (sitting in for George on vacation) reviewed the many fine items for the drawing, while Jim-WA8MPA reported on the planned refreshments including homemade cookies for the break.

Membership: No report

OLD BUSINESS:

Bob-K6UDA re-visited the idea of a Club Swap Meet. He made a motion to move forward with the idea, and it was 2nd by Dave-NO6NO. A brief discussion followed with comments from members with pro/cons. Bob suggested a possible site of the Train Station in Loomis, available to the Club for a \$35 rental fee. Tyghe called for a vote and the motion passed unanimously. Bob agreed to Chair the Swap Meet committee. Dick-WB6EDR reported there were still FD pins signed for, but not picked up. Contact Dick to pick up your pins (K2NE and K6LJW). Bruce reminded the Membership that articles are needed for the Newsletter.

NEW BUSINESS:

None

<u>Other Business</u>: Doc-NM6K gave an interesting report on his recent efforts to get RFI caused by PG&E power lines. Is advice to others in chasing such issues was to "be nice" when talking to PG&E and you will likely get a lot further in the process.

<u>General Announcements</u>: The Club Net meets every Thursday's at 7:30; Board and General meetings occur on the 2nd Friday; Board is held at Round Table Pizza at 6pm, and General meetings at 7:30. Club breakfast (last Saturday), the Elmer Net is held every other Wednesday night at 7:30pm. See W6EK.org for more information or date changes.

Tech-10 & Presentation: The Tech-10 presentation was a video of Field Day-2014 created and produced by Bob-K6UDA. In lieu of the presentation, a "hot wash" discussion was held on FD-2014; what worked/didn't work; what to do next year; learning how to use basic radio functions to combat noise and interference; suggestion not to use any trap verticals, and many other suggestions.



SIERRA FOOTHILLS AMATEUR RADIO CLUB

P.O. Box 6421, Auburn, CA 95604

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2014 MEMBERSHIP APPLICATION

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Name:		Call:	Class:	_ e-mail:
Address:	City:			_ State: Zip:
Associate Name: Call:		Call:	Class:	email:
Phone:	Cellphone:		Application is: (Circle) New Renewal	
Dues / Donations:	:			
Membership: yearly* Associate: yearly*	\$ 22.00 Nan \$ 7.00 Rep \$ Now	ne Badge: eater Donation:	\$ 7.00 \$	Yes (special name)
Misc. Donation:	\$ New \$ Chri	Christmas Donation:		ARRL member? (circle) Yes No
	тот	AL:	\$	Please add \$1 if paying via PayPal
*Prorated dues for NEW Mer	mbers/Associates Onlv			
July \$ 20 /6	\$ 20 /6 October \$ 14/3 + following year			
August \$ 18/5	November \$ 12/2+ following year			
September \$ 16/4	December	\$ 10/1 + following	g year	
OFFICE USE ONLY:	DO NOT WRITE BELOW THIS LINE			
Date:	Treasurer:	urer: Secretary:		Roster:
Payment:	Check Number	k Number: Cash:		PayPal:

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