

W6OTX

W6ARA

PAARA NEWSLETTER

VOLUME 60, NUMBER 7, July 2010

K6OTA

K6YQT

PAARAgraphs



The Official Newsletter of the

Palo Alto Amateur Radio Association, Inc.

Celebrating 73 years as an *active* amateur radio club—*Since 1937*



CALENDAR



July 9, PAARA Meeting, 7:00 p.m.

Menlo Park Rec Ctr
700 Alma Street, Menlo Park

July 21, Board Meeting, 7:00 p.m.

Palo Alto Red Cross
400 Mitchell Lane

July 21, DEADLINE for July PAARAgraphs submissions
Send items for publication to Robin Yee, KI6YTA, at
KI6YTA@ARRL.net

President's Corner

CQ Field Day, CQ Field Day, W6ARA, Whisky Six America Radio America, Field Day! At long last Field Day is upon us and we are just about to activate Signal Ridge, as someone named it, at Bedwell Bayfront Park. As I write this, propagation still looks a little dicey, but we are going to have a great time no matter what.



If you missed the last PAARA general meeting, then you missed out on a chance to prepare yourself for the FD experience. Dean Straw, N6BV, past editor of 5 editions of the ARRL Antenna Book, gave us a great introduction to being a good contest operator. For me, the big takeaways were to keep the contact brief and efficient with a minimum of words, develop a rhythm, and just keep at it even when the going is slow. On the latter point, there have been times near the end of the contest when I have only been making one contact every 5 minutes or so. That isn't the most fun, but I still get a couple of points every 5 minutes. It sure beats

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**You won't want to miss
our next meeting!
JULY 9, 2010**

Our program will be...

**The Official DXpedition Video
of the
January 1999 ZL9CI DXpedition
to Campbell Island**

This great James Brooks film chronicles the record-breaking effort at New Zealand's most remote sub-arctic outposts.



Welcome
New PAARA Members!

 K6CLS, Cliff Sojourner, Sunnyvale
 N4FGU, Andrew Schein, Sunnyvale
 KJ6HZC, Seth Morabito, Santa Clara
 KI6RWY, Bob Van Tyle, San Jose

VE Exams, 3rd Saturday each month, 10:30AM, 145.23— PL=100Hz

Redwood City Main Library, Community Conference Room
 1044 Middlefield Road, Redwood City, CA
 contact: <http://amateur-radio.org/> or Al, WB6IMX@att.net

ELECTRONICS FLEA MARKET

Sponsorship by A.S.V.A.R.O.
 (Association of Silicon Valley Amateur Radio Organizations)
 Second Saturday of month, March-October, 6am-2pm
 Howard M. Krawetz, N6HM 650-856-9761
 Contact: <http://www.electronicfleamarket.com/>

LIVERMORE SWAP MEET. Now in Robertson Park, Livermore, every first Sunday of the month. 7 am to 11:30 am. Free admission for buyers. For further info, see: www.larkswap.com or contact Ian Parker, W6TCP at swapmeet@livermoreark.org

PAARA Palo Alto Amateur Radio Association

Meets 1st Friday 7:00pm each month at Menlo Park Rec. Center; Net 145.230 - PL 100Hz Mondays at 8:30. See our website at <http://www.paara.org/> for more information.

Or contact: Joel Wilhite KD6W, KD6W@ARRL.NET, 650-325-8239

FARS Foothills Amateur Radio Society

Meets 4th Friday each month at 7:30pm

contact: <http://www.fars.k6va.org/>

NCDXC Northern California DX Club

meets 2nd Friday 7:30pm each month,

repeater for member info 147.360, Thursday 8:00PM
 contact: <http://nedxc.org/> or Mike Gavin W6WZ, (650) 851 8699

QCWA Chapter 11

Northern California Quarter Century Wireless Association

Meets third Wednesday monthly at Harry's Hofbrau in Redwood City @ 11:30 AM.

Guests are welcome. Saturday morning net on 146.850 MHz, PL 114.8

NorCalQRP Northern California QRP Club

meets 1st Sunday each month

contact: <http://www.norcalqrp.org/>

SPECS Southern Peninsula Emergency Communication System

meets each Monday 8:00pm on Net 145.27, 440.80 MHz

contact: <http://specsnet.org/> or Tom Cascone, KF6LWZ, 650-688-0441

SCARES South County Amateur Radio Emergency Service

meets 3rd Thursday 7:30pm each month, San Carlos City Hall.

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

SCCARA Santa Clara County Amateur Radio Association

Operates W6UU & W6UU/R, repeater 146.985-pl

Nets: 2m, 7:30pm Mon; 70cm, 442.425+ (pl 107.2) Thur.

meets 2nd Mon each month @ 7:30 PM.

contact: <http://www.qsl.net/secara/> or Clark Murphy KE6KXO 408-262-9334

ARRL/VEC license testing contact 408-507-4698

SVECS Silicon Valley Emergency Communications

Operates AA6BT repeater (146.115 MHz+)

contact: <http://www.svecs.net/> or Lou Stierer WA6QYS 408 241 7999

TEARS The Elmer Amateur Radio Society

Dedicated to operational training, knowledge building &

FCC exam testing. KV6R repeater under construction.

Contact AA6T@ARRL.NET. Most members are Extra

class or VE's. See QRZ dot com/kv6r for class info

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: 147.39 (+600) 151.4 ctcss 441.35 (+5.0 88.5) ctcss

223.96 (+1.6) 156.7 ctcss 1286.20 (-12m) 100.0 ctcss

Meetings are 3rd Wednesday of every month.

contact: <http://wvara.org/>, Bill Ashby N6FFC, 408-267-3118, N6FFC@Juno.com, or

N6FFC@ARRL.NET

American Red Cross, SANTA CLARA VALLEY CHAPTER

contact: <http://santaclaravalley.redcross.org/> or Scott Hensley KB6UOO, (408) 967 7924

fshensley@Novell.com

(please send changes to PAARAgaphs editor: K16YTA@arrl.net)

Please contact Rick Melrose to
 settle your 2010 membership dues so
 you can keep receiving your
 PAARAgaphs.

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no points at all. Another item that Dean stressed for phone is to avoid shouting so that you save your voice. I have certainly been guilty of losing my voice in a contest before! This is more important than you might imagine. Dean ended his talk by having us all be “live” stations in the meeting room, shouting CQ and logging contacts on paper. Dean and Rebar, N6CCH, even created some QRM, by shouting across the room to simulate more noise. It was bedlam, and was a wonderful demonstration of real life contesting. I was quite impressed with how seriously everyone took the exercise and how much fun it was for all of us. If I remember correctly, Rick, N6DQ, was the winner with a total of 13 contacts. Dave, AA6XV, was second with 11. Congratulations Rick and Dave.

On June 12th, all of the station captains and our network manager, Thomas, KG6ZOO, gathered at Doug, KG6LWE’s shop in Redwood City to have something that reminded me of the old ethernet plugfests of old. We gathered all of our radios and computers on Doug’s ping pong table, plus one more folding table, and set everything up to verify that it worked. Each computer was configured with WriteLog and was given an IP address for our local network. We verified that all machines were seen and were exchanging data. We also verified that WriteLog was properly driving the CW keyers. Lastly I verified that the receive crystal filters were all working with the K6WX relay drivers. Everything was a go after a few rough patches. One of those rough patches included a disk failure on David KI6ZHD’s laptop which had to be reloaded from scratch. I know that was a lot of work, so thank you David!

Looking more carefully at propagation, we have had two M-class flares from sunspot 1081 in the last couple of days. There was also a nice radio burst and an extreme UV flash to go with the flares. At this writing, however, the sunspot number stands at a lonely zero, after being in the 40s for most of the last week, and the K index is 3. Looking at the rotating sun on my iPhone’s 3d Sun application, I don’t see any farside sunspots that will help us out. It’s always possible that we could get another magnetic anomaly forming, but things look quiet at this moment. We’ll just have to wait and see, and prepare to be flexible on our band plans.

Field Day 2010 is shaping up to be a great event. I hope you will plan to join us out at Bedwell Bayfront Park on June 25th through 27th. There are still operating opportunities, so don’t hesitate to contact myself, Doug, or any other member of the Field Day team. If you know any young operators for our GOTA (Get On The Air) station, we especially would like to talk to you. Next month there will be a long list of thank you’s, but for now, let me just say CU ON FD DE K6WX.

-Kristen (K6WX)

Board Meeting Minutes

6/16/10

The Board Meeting was relocated to Peninsula Bible Church on Middlefield Road, commencing at 7:45 PM on the 16th of June, 2010. Attending were Kristen McIntyre K6WX (Pres), Doug Teter KG6LWE (VP), Rick Melrose K6RDM (Sec, Database), Ron Chester W6AZ (Treas), Larry Rebarchik N6CCH (Dir), Byron Beck KG6UOB (Dir), Rob Riley KI6INR (Dir), Joel Wilhite KD6W (former Pres), Robin Yee KI6YTA (Editor), Gerry Tucker N6NV (Property Mgr), and Vic Black AB6SO (Membership). A quorum was present.

Secretary’s Report: Rick K6RDM reports that the minutes of the 19th of May, Board meeting had been previously submitted and approved. Four new members joined the club at the June 4th meeting.

President’s Report: Kristen K6WX reported that the Field Day procedure and training exercise that Dean Straw N6BV conducted at the last general meeting, was one of the most lively and enthusiastically received in memory. She reminded the board that PAARA will be handling the DeAnza Flea Market in September and that it’s not too early to be starting on preparations. The club’s participation in the Maker Faire was indeed good PR, but could benefit from better scheduling and organization next year to be as effective as it could be for us. One possibility would be signing people up for Tech classes.

Treasurer’s Report: Ron W6AZ reported that receipts from the last general meeting, our previous auction, and the flea market were good. A discussion followed regarding various aspects of the club raffle and how it serves the club.

Vice President’s Report: Doug KG6LWE and Larry N6CCH said that preparations for Field Day are coming along very nicely. A “network day” last Saturday got the computer system up and working very smoothly. New aluminum for the Force 12 C3 antenna end tips has ar-

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LIFE MEMBERSHIP

Awarded by Action of the PAARA Board

Wally Porter K6URO Dec 2008

Steve Stuntz, K6FS Dec 2007

SmartMeters and Electric Power Measurement, Part 2

Steve Stearns, K6OIK

(This article appeared in its entirety in the April 2010 issue of the *FARS Relay*, <http://archive.k6ya.org/relay/Relay1004.pdf>)

(Continued from the June 2010 issue of PAARAgaphs)

An important point is that power harmonics are only created when current and voltage harmonics are both present simultaneously at the meter. A consumer's load directly causes only current harmonics. A utility's grid design determines its Thevenin source impedance and voltage purity at the consumer's meter. In this sense, a utility that skimps on infrastructure design causes power harmonics. As we will soon see, power harmonics, once created, can lead to phantom power that can affect the consumer's bill.

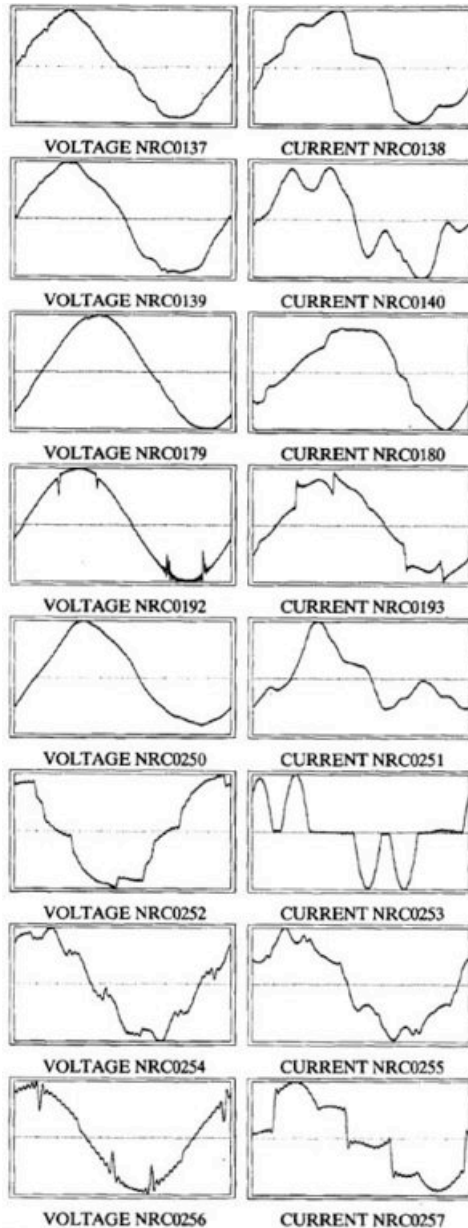


Figure 4. Measured voltage and current waveforms [Filipski].

Figure 4 shows more measured waveforms for eight different kinds of loads. Note how distorted AC voltage and current waveforms

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can be. In general, if the current is not sinusoidal, then the voltage isn't either. The idea of clean sinusoidal AC power is a myth taught in school.

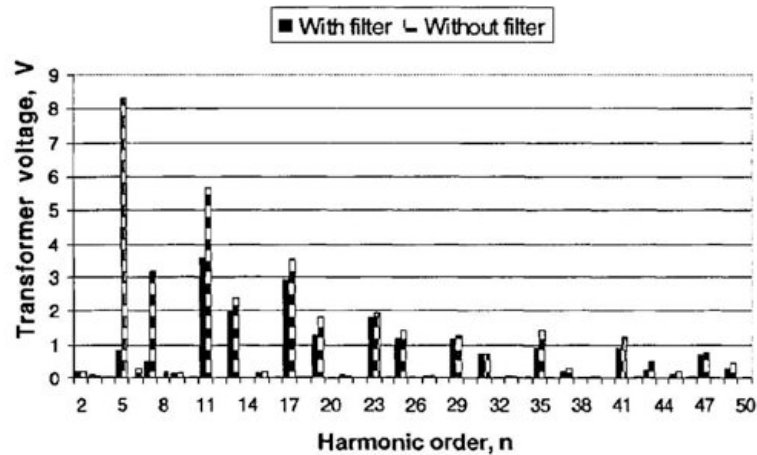


Figure 5. Voltage harmonics, [Lundquist].

The reader may ask how strong can the harmonics of a distorted voltage waveform be? Figure 5 gives some idea of the answer. The vertical axis is linear volts. The amplitudes of the harmonics are significant out as far out as the graph goes, to the 50th harmonic or 3 kHz. Odd harmonics are generally stronger than even harmonics. Harmonics do not decrease monotonically with harmonic order. For example, notice that the 5th and the 11th are stronger than their neighbors. Far out, however, the voltage harmonic amplitudes do roll off roughly as $1/n$. Current harmonics generally roll off more slowly than voltage harmonics. It follows that the infinite series

$$P_{\text{complex}} = \frac{1}{2} \sum_{n=1}^{\infty} V_n I_n^*$$

may converge slowly. Harmonics can, in fact, account for a significant fraction of total power. It should also be mentioned that the bandwidth of some electronic meters is greater than the 3 kHz used in Figure 5. The new meters are capable of sensing some 50 to 100 or more harmonics depending on model.

Troubling Questions

The discussion above leads us to some troubling questions, none of which has been satisfactorily researched or answered. The first question is how much can the meter readings differ between different watt-hour meters due to bandwidth differences alone. A mathematician would answer simply that if one meter's bandwidth includes M harmonics and another meter's bandwidth includes N , where $N > M$, and if both voltage and current are allowed to have arbitrary waveforms, then waveforms exist for which the second meter reports arbitrarily more power than the first meter does. One merely has to design the load to concentrate all dissipated power in the $N - M$ highest harmonics. In this way, the first meter measures zero, while the second meter measures all of the load's power. An engineer would modify the question: For the current waveforms created by actual nonlinear loads that people have in their homes, by how much do the readings of different meters differ? This question can only be answered by surveys and laboratory measurements.

A specific question is: Do CFLs really save energy? As near as I can determine, the only evidence that CFLs save energy came from measurements made using old watt-hour meters, which had smaller measurement bandwidth and were blind to power in the higher-order harmonics of the voltage and current waveforms. Did any competent laboratory such as the National Institute of Standards and Technology (NIST) ever measure the real power consumed by CFLs? Such measurements require specialized equipment for making power measurements. The measurements should be made in a shielded EMI chamber to eliminate stray RF pickup. Laboratory equipment would digitize the voltage and current waveforms of a load separately in a wide bandwidth, and compute the integrated product. It seems unlikely that such accurate measurements were ever made. The claims for the greater efficiency of CFLs were made years before people questioned watt-hour meter physics and performance. The Canadian and ANSI standards for electrical metering don't appear to include such tests among their test protocols. Any competent technician can measure current and voltage waveforms. A simple test setup for measuring CFL current and voltage waveforms with an oscilloscope is shown in Figure 6. However, making accurate power measurements when current waveforms are impulsive with harmonics in the ULF and VLF radio bands requires professional laboratory facilities.

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Figure 6. (a) Setup for testing CFLs; (b) measured waveforms [Korsak].

Concerning the accuracy of electronic power meters, one electric utility’s engineers and consulting engineers (Florida Power) have stated in print: “Highly distorted waveforms (like those in Figure 3) often have a very high crest factor. Electronic meters have some limit to the maximum current magnitude they can interpret correctly because either they reach the upper limit of an A/D converter or somewhere in the electronic circuit an amplifier is driven to its limit; thus some signal truncation may occur under specific circumstances.”

Now “truncation,” the correct term is “limiting,” would normally be to the customer’s advantage if voltage and current samples were simply multiplied and accumulated. However, from the discussion surrounding Figure 2, we saw that electronic meters can use four quadrant accumulators. If a meter uses an FFT, like Cirrus Logic’s CS5463 chip, instead of a Hilbert transform filter, then different algorithms for putting the FFT outputs into the quadrant accumulators can give greatly differing results. To see what can happen, consider the array of numbers.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

We are going to add the numbers, tallying positive and negative sums separately. Consider three methods for doing this.

Method 1: First add all 16 numbers to get -8. Since the sum is negative, we put -8 in the negative accumulator and put zero in the positive accumulator. We write the result as (-8, 0).

Method 2: Sum each row by itself. Then put the negative row sums in the negative accumulator, and put the positive row sums in the positive accumulator. Since every row sum is -2, we again obtain (-8, 0).

Method 3: Sum each column by itself. Put negative column sums in the negative accumulator, and put positive column sums in the positive accumulator. Since column sums are 28, -32, 36, -40, we obtain (-72, 64).

Now suppose the first row corresponds to power in the first four harmonics determined from FFT no. 1. The second row corresponds to FFT no. 2, and so on through FFT no. 4. Suppose that positive numbers represent “active” power delivered from the grid to the customer, and negative numbers represent negative active power delivered from the customer to the grid.

Next consider two different billing policies. Under Policy A, the utility bills for the net active power, i.e. the difference between the accumulators – the value in the positive accumulator minus the value in the negative accumulator. Under this policy, all three methods of tallying harmonic power result in a credit to the customer of 8 units. Now consider the effect of Policy B under which the utility bills for positive active power with no credit for negative active power. Under Policy B, Methods 1 and 2 result in a zero bill, but Method 3 results in a bill for 64 units. We see, therefore, that the customer’s bill ranges from a credit of 8 to a debit of 64 depending on meter accumulation algorithm and billing policy. Odd, true. But this story has a more bizarre twist.

As shown in the example above, each harmonic represents positive or negative active power by itself. It all depends on the relative phase between a voltage harmonic and its corresponding current harmonic at the point of measurement. However, nonlinearities inside the meter, such as limiting, affect these phase relationships. So while net power is unchanged, the directions of active power flow of individual harmonics can be modified and even reversed by nonlinearities in the meter itself. A customer might use 1 kWh, but the meter might report it as 3 kWh positive active and 2 kWh negative active, and the utility using Policy B would bill the customer for the 3 kWh and ignore the 2 kWh. In this example, the meter creates and adds phantom power in equal amounts to the customer’s positive active and negative active accumulators. Normally such phantom power in both accumulators is cancelled when the accumulators are subtracted. However, under Policy B, this subtraction does not occur, and the customer is billed for the positive active phantom power in addition to his real power consumed. This is not fair. But it is altogether more unfair when it is

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the meter's own nonlinearity (e.g. limiting) that created the phantom power in the first place.

That nonlinearities in an electrical circuit can modify the phases of current and voltage harmonics is familiar to analog RF circuit design engineers. In fact, the mathematical technique of "harmonic balance" analysis, used in professional circuit design programs made by Agilent, Ansoft, and Applied Wave Research, was developed precisely to analyze such effects. The interested reader is referred to the engineering literature (cf. Gilbert and Steer) for explanation of the harmonic balance method in circuit analysis and design.

What to Expect?

We expect that as utilities roll out SmartMeters throughout the state, a strange irony will emerge: Those customers who did the most to save energy will see their bills increase the most, while late adopters who still use Edison's incandescent lamps, have no wall warts or consumer electronics, will see little or no increase in their electricity bills. A small increase of a percent or two may sometimes occur when the original electromechanical meter ran "slow" due to increased friction from age. However, the increase due to increasing the meter's measurement bandwidth by a factor of ten or more is much greater than a few percent. Given that the California Public Utilities Commission (CPUC) has allowed the electric utilities to change the definition of the billable watt by changing the measurement bandwidth, it seems reasonable and fair that consumers demand the CPUC to create new electric rates to go with the new meters and refund the difference to consumers who were overcharged by a mismatched application of old-meter billing rates to SmartMeter readings.

Furthermore, because meter nonlinearities can modify harmonic phase relationships to potentially create phantom power (equal amounts of fictitious positive and negative active power), it is reasonable and fair that consumers demand the CPUC to prohibit utilities from billing residential customers for anything except "net" active power. This means credit must be given for negative active power (power delivered to the grid by the consumer) as reported by electronic meters. Until it is proven that electronic meters cannot create phantom active power by altering harmonic phase relations, utilities should be prohibited from using billing policies like Policy B and should be required to bill customers for "net" or "positive-minus-negative" active power, which removes any phantom power from the customer's bill.

Acknowledgment

The author gratefully acknowledges David Dahle's watt-hour meter development history page at <http://watt-hourmeters.com/history.html>

Further Reading

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About the Author

Steve Stearns, K6OIK, started in ham radio while in high school at the height of the Heathkit 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 is currently Senior Staff Engineer at Northrop Grumman's Electromagnetic Systems Laboratory in San Jose, California, where he leads advanced technology projects in advanced signal processing algorithms, active non-Foster circuit design, exotic antennas, and electromagnetic wave phenomena. Steve is vice-president of the Foothills Amateur Radio Society, and served previously as assistant director of ARRL Pacific Division. He has over 50 professional publications and nine patents. Steve has received numerous awards for professional and community volunteer activities.

Preparing for Field Day 2010!



Tips from the expert: Dean Straw, N6BV.



Jim KI6KVW, Rebar N6CCH, and Don KE6CFX, working on one of the elements of one of our KT-34 tri-band beams.



Left to right are Thomas KG6ZOO, our Network Captain; Rebar & Gary, John K6YP & Rob KI6INR, our GOTA Captains; Dave AE6XA, CW ace (bottom); David KI6ZHD, who set up our digital equipment for GOTA (top); Rick N6DQ, the Captain of the CW-B station (bottom); and of course, the indispensable Gerry N6NV at the far right.

Assembling a KT-34 for testing. From left to right are Chris KG6O, Rob KI6INR, Gary KI76HIG, Gerry N6NV, and Jim, Rebar & Don with their backs to us.



(Board Meeting Minutes—Continued from page 75)

rived, and the 40M beam is up. Gary Barnes KI6HIG is thanked for the new high quality baluns he picked up in Fresno. Joel KD6W says we have instructions and firmware for the Cisco IP phones and expect a meeting Friday will have them functioning for use in the Ethernet system. The board discussed other opportunities for increasing our score such as visits from officials and emergency agencies. We have excellent preparation in place to do a great job at Field Day and are very much looking forward to the challenge and just plain fun!

The meeting was adjourned at 9:10 PM.

What Is Field Day?

Field Day occurs on the fourth full weekend in June, and tens of thousands of amateur radio operators gather in public parks, local government emergency operations centers, their homes, their cars, and even bicycles and boats to contact as many other stations as possible. Despite the variety of locations, the most active ones focus on public demonstration of our service and set up temporary radio stations out in the field to simulate the operating conditions we will face in a real emergency or natural disaster. For more information about the event, please read Jack Dane's article describing Field Day at <http://paara.org/fieldday/about/>.

Congratulations to the winners of the June 2010 Raffle!



- 1st Prize: Rebar / N6CCH / Icom IC V-80 / 2m / 5.5W / HT
- 2nd Prize: Linda Leong / KJ6AJN / 30 Amp Desktop Lightweight Switching Power Supply
- 3rd Prize: Greg Miller / WY6P / wiREVO S300 Stereo Bluetooth Wireless Headset with Charger
- 4th Prize: Robin Yee / KI6YTA / Deltran Battery Tender Junior / 12V / 750mA / Auto Float Charge
- 5th Prize: Merritt Yee / KG6TNO / Two Midland FRS/GMRS 2-Way Radios
- 6th Prize: Dave Cooper / K6WA / "SolderSmoke" – A Global Adventure in Radio Electronics Book
- 7th Prize: Marty Wayne / W6NEV / LED Flashlight with Magnifying Lens
- 8th Prize: Byron / KG6UOB / USB LED Light

THANK YOU FOR YOUR SUPPORT of PAARA's exciting monthly raffles!

PAARA had a remarkable year in 2009! If you aren't a member, please join PAARA now and experience fun 2010 events with the "friendliest club around."

K6AK Jim

Tri-City VE Group Test Sessions

Where: Hurricane Electric
 48233 Warm Springs Blvd
 Fremont, CA

When: Saturday, July 10, 9:00 a.m.
 Thursday, August 19, 6:30 p.m.

For more information, contact
 Rita, KI6SSQ@arrl.net, (510) 703-7090
 or
 Bernhard, AE6YN@arrl.net, (510) 364-0611
 or visit
www.sbara.org.

PAARA Exemplary Service Award

- Gerry Tucker, N6NV 2005
- Rice Family 2006
- Jim K6AK, Lisa KG6KQS, Kyle KG6MSK
- Wally Porter, K6URO 2007
- Vic Black, AB6SO 2008
- ??? - 2009



PAARAgaphs—July 2010
Celebrating 73 years as an active ham radio club—Since 1937

PAARA “The Friendliest Club Around”

July 9th Raffle Prizes

FIRST PRIZE: YAESU FT-1900R 2m/55W/Mobile



- Extended Receiver Coverage 136-174 MHz
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- 200 Memory Channels with Alpha-numeric Labeling
- Dedicated 10-Channel NOAA Weather Broadcast Channels
- Adjustable Mic Gain and Wide/Narrow Deviation and RX Bandwidth

SECOND PRIZE: Icom IC-V80 / 2m / 5.5W / HT

- Rugged / Water Resistant / 750mW of Loud Audio
- NiMH / 1400mAh Battery Pack / 13 Hours Operating Time
- Drop-In Charging Base
- PC Programmable with Optional CS-V80
- WX Channel and Weather Alert Function (USA Version Only)
- Transceiver-to-Transceiver Cloning (Optional)



THIRD PRIZE: Samlex 13.2V DC / 5.5 Amp / Power Supply / Output Socket-Terminals



FOURTH PRIZE: wiREVO S300 Stereo Bluetooth v2.0 Wireless Headset with Neckband, USB 2.0, includes Charger (Thanks Bill K6VW0!)

FIFTH PRIZE: ARRL Repeater Directory 2009/2010

SIXTH PRIZE: Sterling Deluxe Wire Stripper

SEVENTH PRIZE: Icom / HRO Coffee Mug

EIGHTH PRIZE: Icom Band Plan and Yaesu World DX Map

Since February 2003, **181 Radios**, including THREE Elecraft K3's, a Yaesu FT-847, an Icom 706 MK IIG, a Yaesu FT-897D, and TWO Elecraft KX1's have gone to Fellow Hams.

Special Thanks to Bob, Howard, Jon, Mark, and everyone at HRO for their continued support!

de K6AK Jim



James Farrey
 Sales Manager

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If you would like to order a badge, see **Lynn Gentry, KG6JPV.**

PAARA Weekly Radio Net

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

<u>Week</u>	<u>Control Operator</u>
1 st	Doug Teter - KG6LWE
2 nd	Paul Petach - KI6QXV
3 rd	Jack Pines - W1VSL
4 th	Marty Wayne - W6NEV
5 th	Mike Bray - N6MEB



Directions to PAARA meeting:
<http://paara.org/meetings/>



Join us for pre-meeting eyeball

Eye Ball QSO gab & gobble

Food will be served at 6:00 sharp, so guests will be on time for the PAARA meeting. Those arriving late will be responsible for their own food order.

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Club meetings are on the first Friday of each month, 7:00pm at the Menlo Park Rec Center, 700 Alma Street, Menlo Park, CA.

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

Membership in PAARA is \$20.00 per calendar year, which includes one subscription to PAARAgaphs \$6 for each additional family member (no newsletter).

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Submissions for PAARAgaphs by the 3rd Wednesday

Text: MSWORD, RTF, or TEXT

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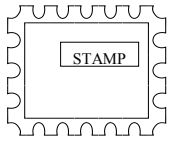
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PAARAgaphs — July 2010

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