SCCARA-GRAM

Santa Clara County
Amateur Radio Association

Volume 27, Number 8 August 2011

August meeting

Because of a scheduling conflict, this time we'll be in conference **room B06**, in the basement of the main hospital building. B06 is toward the south-west part of the building, across from the cafeteria. See the map (this page).

President's Prose

The Electronic Flea Market this month (August) will be hosted by SVECS. If you would like to help out and haven't signed up, contact Lou Steirer (WA6QYS) - he's listed on page 2 of the SCCARA-GRAM under Officers and Directors. SCCARA and SVECS have a long-standing mutual benefit arrangement.

Speaking of SVECS, the latest quarterly breakfast happened on July 23 and the speaker was Jim Yoke, Emergency Services Coordinator from the Santa Clara County Fire Department. Jim presented a post-earthquake timeline and scenario from the first minute through several months that was most thought-provoking. If you weren't there, you missed a very interesting talk.

I believe, but I don't have the facts, that carbon monoxide detectors are now required in all dwelling units as of the first of July. I dutifully purchased mine, and they are residing comfortably on the workbench, waiting to be installed. I'm sure you know the story.

I missed both the general meeting and the Board meeting in July since I was spending a few weeks in western Montana where I spent the first 23 years of my life. Thanks to Fred (AE6QL) for filling in for me.

Part III of a multipart article on transmission lines and SWR should appear in this issue of the SCCARA-GRAM, provided Gary can work it in. There will be four or five parts in all. I hope you find them informative.

Don't forget the 2-meter FM net on Monday nights, and the 10-meter SSB net (28.385 MHz USB) on Thursday nights. Anyone who has a license can join in.

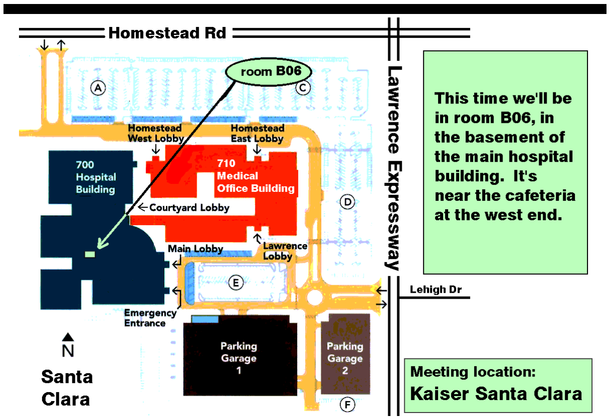
73,
Don, AE6PM

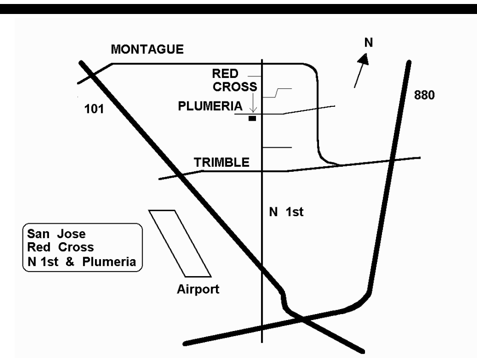
Calendar

8/8	**SCCARA General Meeting**
8/13	**Electronic flea market** at De Anza
8/15	**SCCARA Board Meeting**--(San Jose Red Cross, 7:30p, all are welcome)
8/20	**SCCARA picnic** Mary Gomez Park Santa Clara

General Meeting

Day:	Monday, Aug. 8, 2011
Time:	7:30 PM
Place:	Kaiser Santa Clara, **Room B06**
Featuring:	Herb Sullivan K6QXB: AMSAT





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The deadline for articles is the last Monday of the month.

SCCARA was formed in 1921 and became a non-profit corporation in 1947. SCCARA is an affiliate of the American Radio Relay League (ARRL). The club station is W6UW.

Web page: http://www.qsl.net/sccara.

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(all officers are also directors)

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Director	Greg Lane KF6FNA e-mail: kf6fna@comcast.net	393-5607
Director	Gary Mitchell, WB6YRU e-mail: wb6yru@ix.netcom.com	269-2924

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SCCARA REPEATERS

SCCARA owns and operates two repeaters under the call W6UU:

2 meter:	146.985 -	PL 114.8
70 cm:	442.425 +	PL 107.2

Phone auto-dial and auto-patch is available. The two meter repeater is located at Eagle Rock near Alum Rock Park in the foothills of east San Jose. The 70 cm repeater is located at the Regional Medical Center (formerly Alexian), east of downtown San Jose, north of 280 and 101.

SCCARA NETS

On our two meter repeater: Mondays at 7:30 PM, (not the second Monday--our meeting night). Coordinator: Don Village, K6PBQ. On ten meters, 28.385 MHz USB, Thursdays at 8:00 PM. Net control: Wally Britten, KA6YMD. Visitors welcome.

N0ARY PACKET BBS

SCCARA hosts the packet BBS N0ARY (Mt Umunhum). User ports: 144.93 (1200 baud), 433.37 (9600 baud), telnet sun.n0ary.org (login "bbs"). Sysop: Gary Mitchell, WB6YRU (packet info: www.n0ary.org/ncpa)

TELEPHONE NUMBERS

SCCARA contact Clark KE6KXO:	408 262-9334
ARRL/VEC Silicon Valley VE group, Morris Jones, AD6ZH:	408 507-4698

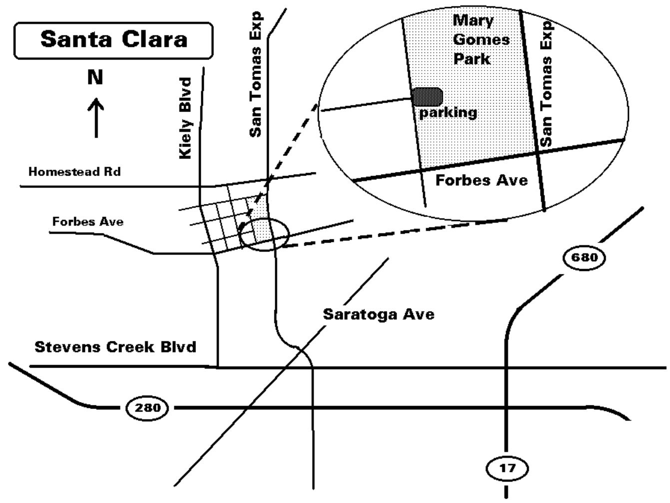
Picnic

The SCCARA picnic this year will be on Saturday August 20th at 10AM until 4PM or so at Mary Gomez Park in Santa Clara. It's located at the north-west corner of San Tomas expressway and Forbes. From San Tomas, go west on Forbes, turn right (north) on Bucher, then right into the small parking lot.

We will have a HF station set up again for a miniature Field Day operation. Gwen and Lou will be running our bingo game again with the help of Edward and Sheryl, so bring a gift or two for prizes.

The club will provide sodas, plates, utensils, condiments, and charcoal. Please bring your own meat and a dish to share.

Don Village K6PBQ



Electronic flea market

August 13th is the next Electronics Flea Market at De Anza College. The market will be run by our ARES friends in the Silicon Valley Emergency Communications System (SVECS), the sponsors of the AA6BT repeater 146.115 MHz, +offset, PL of 100Hz. Let us support them by offering to help out at the food table at the flea market. Let Lou, WA6QYS (408-241-7999) know if you can be available for any 2 hour shift from 0500 to 1300 hours on August 13th.

Lou WA6QYS

ARRL News

From *The ARRL Letter*, July 28, 2011

ARRL OFFICIAL OBSERVERS TEAM WITH FCC SOLVES ROGUE KEYER PROBLEM ON 17 METERS

On July 15, Walt Bilous, K3DQB -- an Official Observer (OO) in ARRL's Eastern Pennsylvania Section -- notified ARRL Headquarters of a keyer continuously sending a series of dits on 18.0855 MHz. According to ARRL Field Regulatory Correspondent Chuck Skolaut, K0BOG, Bilous kept hearing the dits throughout the night.

Skolaut asked Bilous to alert other OOs to monitor the frequency, but the signal was proving hard to locate via direction finding due to changing propagation and fading conditions on the band. ôWe alerted OOs across the country to monitor and collect additional information for us including bearings and signal strength reports,ö Skolaut said. “We had a great response from quite a number of Official Observers.” But the signal was still proving elusive, so Skolaut contacted the FCC for assistance.

“By Monday evening, July 18, the FCC indicated that the dits were originating in California, ruling out speculation that it might even be coming from outside the United States,” Skolaut explained. “On Tuesday, we received word that the FCC had pinpointed the exact location of the dits. They visited the radio amateur’s home, found the cause and the transmitter was immediately shut off.” According to the FCC, an amateur in Northern California had unintentionally left his keyboard too close to his keyer paddle, and the paddle somehow got pushed against the keyboard, making it send continuous dits.

“We appreciate the efforts of all the involved Official Observers and the prompt follow up by the FCC in pinpointing the source of the transmissions and getting them stopped to prevent further interference on the band,” Skoluat said. “Since signals on 17 meters may travel long distances, we received a number of reports from stations overseas who supplied signal strength reports along with bearings. This incident prompts a very important reminder to all amateurs to always be vigilant when operating and if leaving your operating position, to turn off or secure your transmitters to avoid situations like this from happening.”

Donations

Thanks to the generosity of long time members Roy, K6VIP and Virginia, K6IUU, SCCARA has acquired a Kenwood TS 440S with hand and desk mikes and a Astron RS20A power supply, Icom IC255A 2 meter transceiver, Kenwood TH75A dual band HT, 12V 6A power supply, speaker mike, hand-held mobile power adapter.

On behalf of SCCARA, I would like to thank Roy and Virginia for their donation.

Lou WA6QYS

Meeting Minutes

General Meeting, July 11, 2011

{No minutes were received – Ed.}

Board Meeting, July 18, 2011

{No minutes were received – Ed.}

Need Help?

Amateurs have a long history of helping each other. An experienced amateur who helps another is traditionally called an “Elmer.” If you have a question or problem, you are encouraged to ask one of SCCARA's Elmers. Below is a list of topics including who to contact for each.

If you consider yourself to be reasonably competent in at least one area of amateur radio and would be willing help others, please fill out an Elmer form from the club secretary.

Antennas, feed-lines, tuners: WB6EMR, W6JPP, K6PBQ, WB6YRU
Lightning protection, grounding: WB6YRU
Station set-up, equipment: K6PBQ, W6JPP
TVI/RFI: WB6YRU
Homebrew projects, construction: KD6FJI, WB6YRU
Computers: older IBM PC: WB6YRU
Packet Network (BBS, forwarding): WB6YRU
Code operating and installations: WB6EMR, K6PBQ
DX (long distance/propagation): WB6EMR
Emergency operating/preparedness: WA6QYS
HF operating techniques (SSB, CW): WB6EMR, K6PBQ
Legal/FCC rules: WB6YRU
SCCARA (club inner workings): K6PBQ, WB6YRU, WA6QYS
EchoLink: KK6MX

WB6EMR, James D. Armstrong, Jr.,
evening & msg: (408) 945-1202

KD6FJI, Lloyd DeVaughns,
(408) 225-6769 e-mail: kd6fji@arrl.net

KK6MX, Don Apte, (408) 629-0725
e-mail: kk6mx@aol.com

W6JPP, John Parks, (408) 309-8709
e-mail: w6jpp@arrl.net

K6PBQ, Don Village, (408) 263-2789
e-mail: donvillage7@yahoo.com

WA6QYS, Lou Steirer, (408) 241-7999
e-mail: wa6qys@arrl.net

WB6YRU, Gary Mitchell, (408) 269-2924
packet: home BBS NOARY
e-mail: wb6yru@ix.netcom.com

Newsletter Notes

A big thank you to Don AE6PM for another instalment of his series on transmission lines and SWR. It may be a bit technical for some of us, but that is the nature of this hobby after all.

This moth the band plan chart includes the amateur bands just above the more familiar UHF bands. This is the microwave region. Of particular note is that nearly everything is all-mode and experimental, (probably with emphasis on the “experimental” part). Just a few spots are designated for beacons or calling channels.

The amount of bandwidth we have up there is amazing. The 2.9 cm band can contain everything from DC through 70 cm with room to spare, and a quarter wave whip is the length of an eyelash.

73, Gary WB6YRU, editor

More on Transmission Lines and SWR

Part 3
By Don Steinbach, AE6PM

It's a common misconception that SWR is the ratio of the antenna feed-point impedance to the transmission line characteristic impedance. That is only true if the impedance of the antenna is purely resistive, which in the real world is almost never the case. If there is any reactance at all in the antenna feed-point impedance, then the SWR isn't simply the ratio of the impedances.

SWR and Related Relationships

SWR, forward (incident) power, reflected power, reflection coefficient and return loss were all addressed in Part II of this series. The relationship of these parameters to one another is shown in Table 1.

Power Ratio (P_R /P_F)	Reflection Coefficient (ρ)	Standing Wave Ratio (SWR)	Return Loss (RL) in dB
0.0	0.00	1.0	∞
0.05	0.22	1.6	13.01
0.1	0.32	1.9	10.00
0.2	0.45	2.6	6.99
0.3	0.55	3.4	5.23
0.4	0.63	4.4	3.98
0.5	0.71	5.8	3.01
0.6	0.77	7.9	2.22
0.7	0.84	11.2	1.55
0.8	0.89	17.9	0.97
0.9	0.95	38	0.46
1.0	1.00	∞	0.00

Table 1. The Relationship Between Power Ratio, Reflection Coefficient, SWR and Return Loss

Calculating SWR

SWR, for a given antenna installation, can usually be measured much more easily than it can be calculated since instruments to measure it (SWR meters) are readily available or are easily built by the average ham. There are times, though, when calculating the SWR for a particular circuit is desired. For example, designing a calibration test load to test an antenna analyzer. An example follows.

The first step in computing SWR is determining the reflection coefficient (ρ) from one of several formulas:

$$r = E_R/E_F = I_R/I_F = \text{sqrt}(P_R/P_F) = (Z_L - Z_0) / (Z_L + Z_0)$$

Where:
ρ = reflection coefficient
E_R = reflected voltage
E_F = forward (incident) voltage
I_R = reflected current
I_F = forward (incident) current
P_R = power in the reflected wave
P_F = power in the forward (incident) wave
Z_L = the complex load impedance whose real part is R_L and whose reactive part is X_L
Z_0 = the complex line characteristic impedance whose real part is R_0 and whose reactive part is X_0.

And

$$SWR = (1+ |\rho|) / (1-|\rho|)$$

For low-loss transmission lines, or where (in the case of a calibration test load) there is no transmission line, the characteristic impedance Z_0 is almost completely resistive so that Z_0 is approximately R_0 and X_0 is approximately 0. The magnitude of ρ then simplifies to:

$$|r| = \text{sqrt}[((R_L - R_0)^2 + X_L^2) / ((R_L + R_0)^2 - X_L^2)]$$

R_0 is the resistance the antenna analyzer expects for SWR=1
R_L is the series resistance of the test load
X_L is the series reactance of the test load

Let's use this information to design a calibration test load that might be used to check the accuracy of an antenna analyzer:

I'm going to assume that R_0 = 50 ohms, the reference impedance for most analyzers. The test load will be a series RC circuit and I'm going to arbitrarily make the resistive part R_L = 50 ohms and the reactive part X_L = –j50 ohms at 28 MHz.

$|r| = \mathrm{sqrt}[((50 - 50)^2 + (-j50)^2) /((50 + 50)^2 - (-j50)^2)]$

$|\rho| = \mathrm{sqrt}((0 + 2500) / ((100)^2 + 2500)) = \mathrm{sqrt}(2500/12500) = \mathrm{sqrt}(0.2) = 0.4472$

SWR = (1 + 0.4472) / (1 - 0.4472) = 2.618

The value of the capacitor can be calculated from $X_c = 2\pi fC$. C = 115 pF.

I have 12 calibration loads like this that I built from surface mount components mounted on male BNC connectors. I got the idea from the November 2006 QST magazine. Any antenna analyzer should be evaluated using a complex (there's that word again, Z = R ± jX) load such as this because that's the real world. Simply connecting a 50-ohm resistor to the analyzer and seeing a SWR of 1 doesn't cut it. It's beyond the scope of this article, but before buying any antenna analyzer one should read some of the technical (as opposed to rah-rah non-technical) reviews available on the internet.

Transmission Line Properties

Certain transmission line lengths have interesting properties:

1. An open-circuited quarter-wavelength transmission line looks like a short circuit at its free end.
2. A short-circuited quarter-wavelength transmission line looks like an open circuit at its free end.
3. A terminated half-wavelength transmission line repeats the terminating impedance at its free end.
4. A short-circuited transmission line shorter than one-quarter wavelength appears inductive at its free end.
5. An open-circuited transmission line shorter than one-quarter wavelength appears capacitive at its free end.

Lengths of transmission line that are exact multiples of a quarter-wavelength have the properties of resonant circuits. With an open-circuit termination, the input impedance of the line acts like a series resonant circuit. With a short-circuit termination, the line input simulates a parallel resonant circuit. (The ARRL Antenna Book, 21st Edition, page 24-14).

Always remember that the physical length of a transmission line is shorter than the calculated free-space electrical length because the velocity of propagation is slower in the transmission line and the time required for a signal of a given frequency to travel down a length of transmission line is longer than the time required for the same signal to travel the same distance in free space. This delay is expressed in terms of the speed of light, and is referred to as the velocity factor (VF) of the transmission line. (The ARRL Antenna Book, 21st Edition, page 24- 3).

For example, the calculated electrical length of a transmission line one-wavelength long at 10 MHz in free space (VF=1) is:
a) 299.7925/10 or approximately 30 meters or
b) 983.5712/10 or approximately 98.4 feet.
The physical length of the transmission line would be 25.5 meters or 83.6 feet for VF=0.85, typical for most RG-8 coax (a meter is 39.37 inches).

If the electrical length of the transmission line is critical, the VF of the exact piece of transmission being used should be determined experimentally (more on this later). Alternatively, the length can be 'trimmed' while watching the results on an antenna analyzer. The VF varies somewhat with frequency and even within production runs of the same cable.

Antenna Effects

The chances of a transmission line being an exact impedance match to an antenna is somewhere between zero and none. A dipole antenna, for example, has a theoretical free-space impedance of 73 ohms at resonance. As the frequency applied to the dipole is varied away from resonance, however, a reactive component appears. When the frequency is greater than resonance, then the antenna tends to look like an inductive reactance, so the impedance is Z = R + jX. Similarly, when the frequency is less than the resonance frequency, the antenna looks like a capacitive reactance, so the impedance is Z = R – jX. Also, at distances closer to the earth's surface the resistive component may not be exactly 73 ohms, but may vary from about 30 to 130 ohms. (From the Practical Antenna Handbook, Fourth Edition, page 458).

Transmission Line Effects

When installing an HF antenna, we usually just grab whatever coax is available and everything works fine. Taking the time to characterize that coax while both ends are accessible can pay dividends in the future, since you'll be able to tell much more about the antenna after everything in place. As I stated in Part I, what you see at the transmitter end of the transmission line probably isn't what's happening at the antenna, and you may be able to gain some performance by knowing the difference.

The impedance transforming properties of the transmission line can lead to erroneous conclusions about what's actually happening at the antenna. The data in Table 1 is from a 10-meter inverted V antenna fed with a 74-foot length of Columbia 1188 coax. The numbers in this example are taken from the ARRL Antenna Book, 21st Edition, page 27-31. The 'measured' values of R and X are as seen at the free (transmitter) end of the transmission line. The 'corrected' data shows the values present where the transmission line connects to the antenna, i.e., the impedance transformation effect of the transmission line has been removed.

Data Point	Freq (MHz)	Measured R	Measured X	Corrected R	Corrected X
1	27.0	44	31.5	24	-65
2	27.2	60	34.9	26	-56
3	27.4	75	31.0	30	-51
4	27.6	90	14.5	32	-42
5	27.8	90	-7.2	35	-34
6	28.0	75	-20.7	38	-24
7	28.2	65	-23.0	40	-19
8	28.4	56	-18.3	44	-12
9	28.6	50	-14.0	44	-6
10	28.8	48	-6.9	47	1
11	29.0	50	0	52	8
12	29.2	55	6.8	57	15
13	29.4	64	10.2	63	21
14	29.6	78	6.8	75	26
15	29.8	85	0	78	30
16	30.0	90	-16.7	89	33

Table 1 – Measured (uncorrected) and Corrected Data for 10-Meter Antenna Example

Looking at the measured data, it appears that the antenna has three resonant frequencies (where the reactance is zero): one between 27.6 MHz and 27.8MHz, one at 29.0 MHz and one at 29.8 MHz. That's an unlikely condition. The data is plotted in Fig. 1.

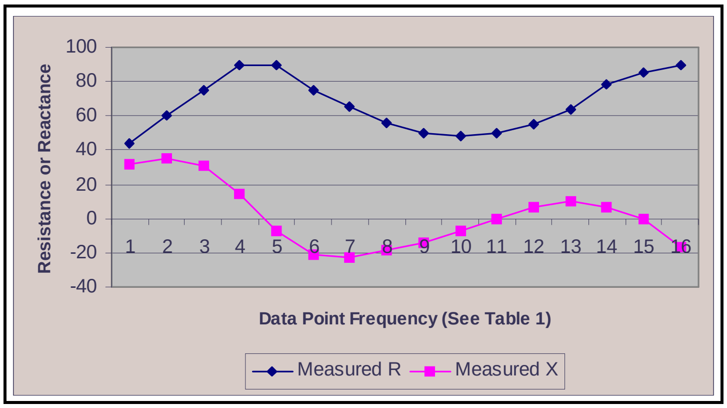


Fig.1 – Plot of uncorrected data from Table 1.

The corrected data, where the transforming effect of the transmission line has been removed, shows the "real" antenna with a single resonant frequency between 28.6 and 28.8 MHz (between data points 9 and 10 where the reactance X goes through zero). See Fig. 2. Obviously, in this case, the antenna parameters as seen at the free end of the transmission line are nothing like the parameters seen at the antenna.

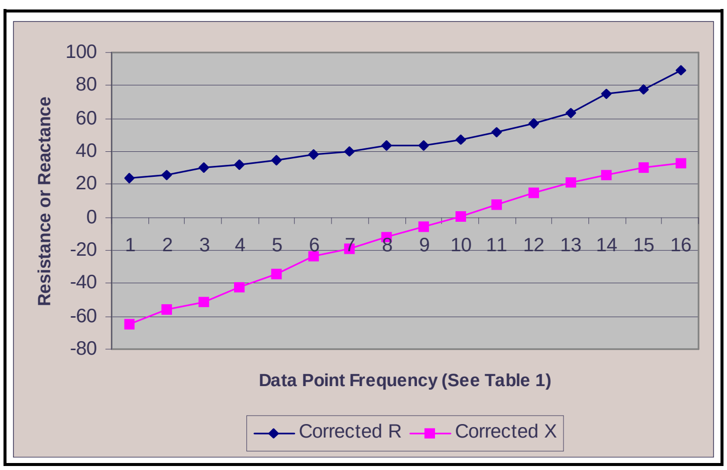
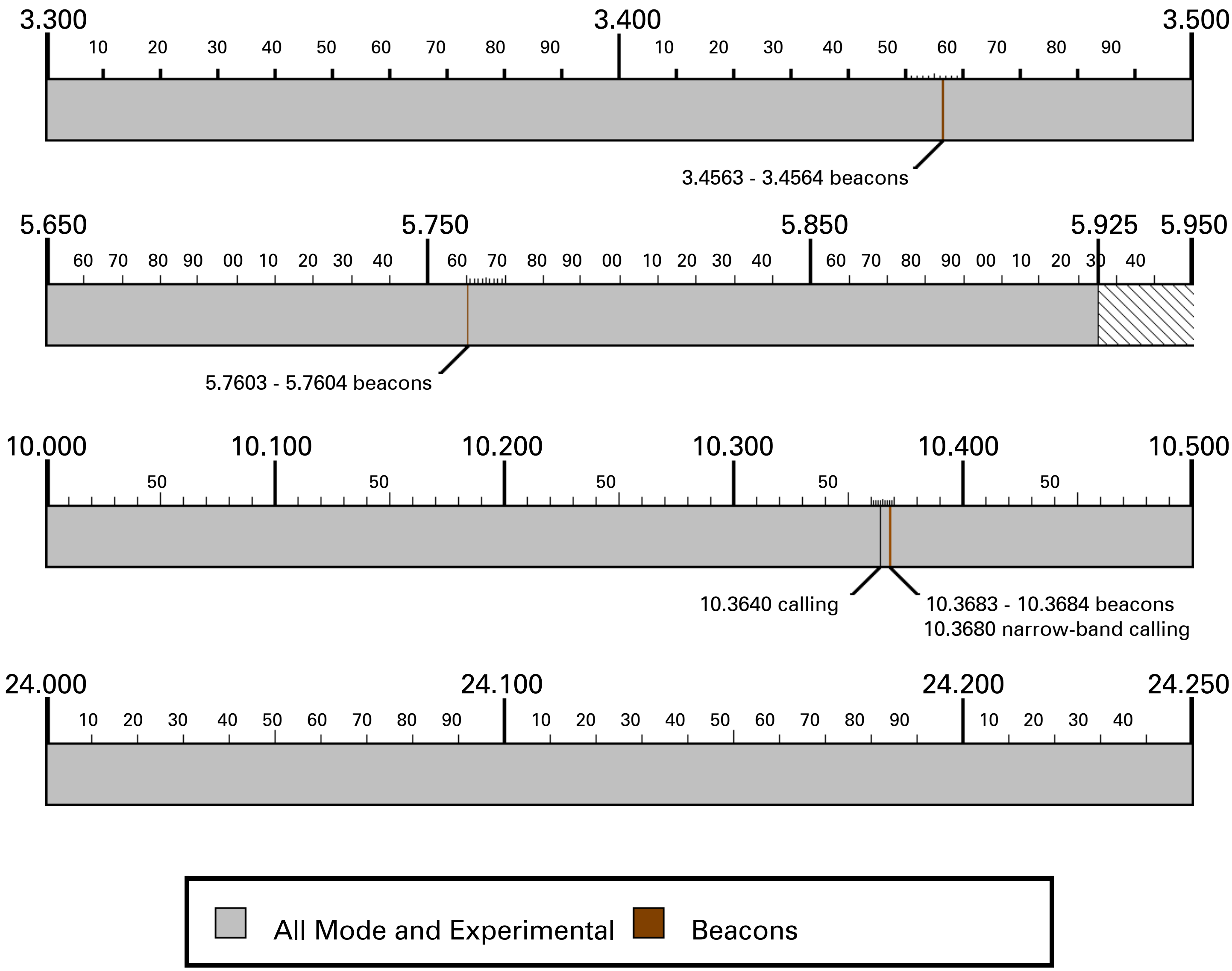


Fig. 2 – Plot of corrected data from Table 1.

More next month … stay tuned.

SHF Band Plans for Northern California
8.8 cm, 3.300 - 3.500 GHz
5.2 cm, 5.650 - 5.925 GHz
2.9 cm, 10.000 - 10.500 GHz
1.2 cm, 24.000 - 24.250 GHz



For general Amateur Radio, see ARRL (www.arrl.org)
San Bernardino Microwave Society (http://www.ham-radio.com/sbms/)
50 MHz & Up Group (San Francisco bay area) (http://www.50mhzandup.org/)

NCPA Northern California Packet Association
The digital organization of Northern California. www.n0ary.org/ncpa

December 15, 2010

SCCARA
Santa **C**lara **C**ounty **A**mateur **R**adio **A**ssociation
PO Box 6
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Affiliate of the ARRL,
American Radio Relay League

FIRST CLASS

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SCCARA Membership Form for 2011

If none of your info has changed, fill in name and call only

Name: ______________________ Call: ____________ Class: E A G T N

Address: ______________________________ Licensed since (yr): ________

City: ____________________ State: ____ Zip: ______ - ____ Licence Expiration Date (mo/yr): ________

Telephone: ( ) ________________ ☐ New Member ☐ Renewal
☐ I'm also a member of the ARRL

E-mail: ____

Memberships begin January 1 and expire December 31.
If renewing: annual membership dues (base rate) are: $20 Individual, $25 Family, $10 Student (under 18)
For new members:
If joining in January: base rate
If joining in February through October: base rate x (11 - month) x 10% (e.g. for June, that would be: base rate x 50%)
If joining in November or December: free for November and December if paying the base rate for the following year

$ ________ **Dues payment** for: ☐ individual ☐ family ☐ student

For family memberships (at the same address), please include a separate form for each family member.

I want the newsletter by: ☐ U.S. Mail ☐ internet (make sure your e-mail address is legible and correct)

Give this completed form (or copy) with payment to the Secretary or Treasurer at any meeting or mail to the club address.

Rev. 6/16/2008