



# Save the Date

## Club Meeting

**4 February 2015**

Ron K2RP and John N6KOI will present the program. HF Remote meets at 7pm.

## Board Meeting

**11 February 2015**

Palomar Amateur Radio Club board meeting at 7:00pm at W6GNI QTH.

## Club Events

**April, May 2015**

Operating Day in April, and possible public demonstration at Carlsbad Faire in May

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# State of the Club for February

Happy Valentine's Day! I'd include some chocolates for you, but technology has not yet reached that level of transportability.

We had a great program last month about modern radios and their manufacture. To round-out the overview radio art, this month, our own K2RP (Ron) and N6KOI (John) will regale us with "The State of the Ark"

Seventeen of you attending last month's club meeting filled out a randomly distributed anonymous survey. It was simply a way to read some Club members "out in the Club audience" thoughts about Club activities, events in which they wished the Club participated, etc. The results were interesting.

There was a strong sentiment that PARC should be more visible in the San Diego County Fair, the Carlsbad City Fair, the Oceanside fair, etc. These are all worthy objectives. More on this later.

There were also interesting comments about "Elmering" and the lack of opportunities to "Elmer". As I mentioned at last month's meeting, I too think it a shame that "Elmering" is shorted these days. So I have a some questions for you. When was the last time you "Elmered" a start-up ham? When will you do so again? Will you do so?

"Elmering" has some measurable positive effects on our hobby. It brings in new blood to what, unless reversed, will soon be no more than an ARRL list of names with SK following the deceased's call sign. (In case you haven't noticed, there is a lot of the latter going around).

The other measurable effect, of importance to our Nation is that "Elmering" fosters valuable interests for people who, unless encouraged, may miss careers in science and technology. Do you remember how that 1957 Sputnik launch, and the excitement that arose from hams throughout the United States who listened to it's CW telemetry resulted in a huge influx of engineering students to colleges, and of citizens to ham radio, many of whom went on to set records in technical development? Do you remember the quiet thrill of building your first complex radio, a crystal receiver?

Those are the results of "Elmering". Look around you and you will see the aging members of that generation. Who and how many are the

newcomers? And other than figuring out how to install an app on their smartphone in order to surf dubious websites, what else might attract the new generation to a technical career?

So how to "Elmer"??? Remember that to you, those first steps in ham radio were scary and "mystical". You wondered how it was possible for that guy next door to be a genius, and whether you would ever become such a genius? And now, to your neighbor, you are seen as a genius because you understand all that "techie stuff". You understand wi-fi, modems, pixels, digital communications, computers, etc.

So my challenge to you. Set yourself a date by which you will have "Elmered" a person into a ham license or "Elmered" one of the many "new techs" into actually getting on the HF bands, or participating in Field Day, or some other measurable improvement in the person's comprehension of ham radio.

Speaking of Field Day. It is right around the corner! This year, on June 27th and 28th, PARC will once again celebrate Field Day with our traditional flair. We are close to confirmation of an excellent FD site! I challenge you to plan on participating in the Club's FD activities. NO. You DO NOT have to be a 60 WPM CW code operator. You don't even need an amateur radio license to operate the bands from a participating amateur FD site! All you need is a willingness to participate in the many FD preparatory activities (antenna and tower preparations, coaxial cable check-out, electric generator testing, etc.) and hopefully also a desire to be at the FD site. You can have fun, camaraderie, and even a chance to work the bands in a contest.....ooopppss ...work the bands! FD is not a contest!

And having earlier mused about "Elmering", just think of the fantastic opportunity to bring a young neighbor or family member to a place where they can see and hear the magic of radio!

73 and Good DX  
NN3V  
Charlie

# The Great Shoot-Out of 2014

## Part 3

by Michelle W5NYV

Defining audio quality is fraught with peril. Just a brief listing of the descriptive words that most hams use when trying to capture the essence of voice communications gives clear warning. Signals have clarity, brightness, brilliance, flatness, or dullness. Some signals are splattered and some scintillate. Defining audio quality objectively seems like a better idea, but like most complex structures, speech is remarkably resilient to being fully characterized by scalar values.

Amateur radio encodes the idea of an objective measurement of intelligibility into RST reports. RST stands for readability, strength, and tone, and each category has an accepted number of levels indicating the quality.

Readability is a qualitative assessment of how easy or difficult it is to correctly copy the information being sent during the transmission, and relates directly to intelligibility. Readability is measured on a scale of 1 to 5.

1	Unreadable
2	Barely readable, occasional words distinguishable
3	Readable with considerable difficulty
4	Readable with practically no difficulty
5	Perfectly readable

Strength and tone have their own scales and definitions. While signal strength has an obvious relationship to intelligibility, for the purposes of this discussion we are going to assume that the audio signal under discussion was transmitted with sufficient power.

This encoding has use, if only to give contesters something to exchange with each other. The raw intelligibility of a particular voice communication tends to be uncontroversial, in that when a crowd of operators all hear the same transmission, they all generally agree on the audio being either intelligible or not. However, beyond the fundamental and objective question of whether or not the transmission is intelligible are many other questions concerning subjective quality and whether or not customary practices in amateur radio increase or decrease audio quality.

These are difficult questions to answer because one operator's preference in audio may be quite different from another's. The contrast between objective and subjective audio quality turned out to be a central issue in the Shootout. Whenever judgments about audio quality are invited, the difficult task of defining what exactly contributes to quality looms right up.

Getting from completely unintelligible to intelligible means going from an RST readability score of 1 to 3. It's easy to see that one must reduce distortion and interference in order to uncover the signal in the first place. However, once the signal can be copied, then it becomes much more interesting. Getting from readability score of 3 to 5 is a process that can be difficult to define. Compression decisions, equalization settings, and bandwidth limitations are some degrees of freedom that directly affect audio quality. Continuing to eliminate distortion and interference is of course still necessary, but one can indeed have a painfully clean and powerful signal that has been compressed or equalized in a way that reduces intelligibility, instead of enhancing it.

On the battleground between readability 3 and readability 5, both subjective and objective measurements are made. For example, "brilliance" in amateur radio audio is a very frequently used audio battleground and equipment marketing term, and came up prominently in the Shootout. But, what exactly does that term mean? Talking about audio that "sparkles" makes as much sense as colors that "shout", but anyone that has ever confronted a pair of lime green and bright orange paisley pants can certainly see the volume.

In audio research, brilliance is a technical term and is the presence of a an overtone lying between 2800 and 3200Hz. This tone is believed to be generated by structures that resonate or ring in the larynx. Obviously, if an audio signal is sampled in such a way as to eliminate or reduce the existence of such an overtone, then the sort of brilliance that audio researchers are referring to would be absent from a radio transmission, and you would not hear what an audio scientist would call "brilliance".

In amateur radio circles, brilliance is generally taken to mean that an audio signal has a certain dynamic range that has high enough time domain and frequency domain response for good approximation live speech. In other words, there has to be enough treble and enough bass, in the right proportions, and there has to

be a fast enough response in the time domain to give clearly articulated phonemes. Limiting the frequencies or smoothing the attack of each syllable or sub-syllable directly affects the perception of audio brilliance. But, those aspects don't objectively define "brilliance". The settings one person finds brilliant may sound harsh to another, and tinny to a third.

Software defined radio (SDR) doesn't have a monopoly on complicated audio settings. Almost any radio on the market has plenty of knobs to turn to change the audio response. What SDRs potentially allow for is customized audio profiles that are learned through adaptive algorithms. In this case, the radio could possibly learn exactly what equalization is necessary at that particular time, for that particular band, and that particular mode, which leads to maximized intelligibility. This requires feedback from the operator at some level, or else sophisticated software that can tell when your speech is fast and stress-free, which may indicate a high-intelligibility conversation. These sorts of functions can't be found on any amateur radio SDR. At least, not yet.

The pressures on high-quality audio are not limited to amateur radio. It's a common observation that cellular phone audio quality does not compare favorably at all to land-line telephony. There are reasons for this, first and foremost the reduced bandwidth allocated to cellular audio compared to landline telephony, and the likelihood of multiple encodings and decodings in the cellular communications chain. Unless your voice call stays within the same network, and therefore only has to be sampled and encoded once, your voice will undergo multiple encodings and decodings and recodings, with loss at each stage, and reduced audio quality at the end.

The advantage to this trend is mobile communications channels that pack in more people per Hz. For amateur radio, the future of audio quality means using modes that allow the entire bandwidth of the human voice to be transmitted, and radios that allow for advanced and personalized equalization algorithms that successfully enhance speech. The tension between the desire for better audio quality, which usually means more bandwidth, and

the good amateur practice of begin frugal with both bandwidth and power means that there is plenty of opportunity for innovations. Audio quality is only as strong as the weakest link in the chain. The decision on how to sample the voice, how it is filtered, compressed, transmitted, what sorts of things happen to the signal while it's in the channel, and how it's demodulated and decoded at the receiving end are all factors. Only the receiving end was considered in the shoot out. With the same signal being copied by both radios, some of the factors are an equal burden to both radios.

Finally, there is another very important subjective measurement, and that is fatigue. An operator may experience fatigue with one radio, and not with another, even with the settings all configured to give what the operator considered to be an ideal audio response. Fatigue may come from the integration of all the audio power weighted by frequency. Therefore, a radio that sounds louder might cause less fatigue than a softer-volume radio, due to equalization in the lower-volume radio putting more fatigue-causing frequencies in the operator's ear. Or, fatigue may come from greater cognitive effort required to decipher words that one radio requires compared to another one. Differences in spectral response with respect to speech, when comparing transmitted audio to the live audio that are brains pattern-match with, can cause significant fatigue. With practice, the fatigue lessons. The brain gets used to listening to audio that is spectrally limited and equalized in funny ways. Almost everyone can relate to this when thinking back to their first few contests or field days.

Looking forward to the next shootout! :)



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# IEEE [amateur] Radio and Wireless Week

by Michelle W5NYV

Every year, somewhere in (almost always) the United States, the Institute of Electrical and Electronic Engineers (IEEE) holds a conference called Radio and Wireless Week. This year that conference was held 25-27 January in San Diego, CA.

"The Meeting" as regulars to the event call it, is sponsored by the MTT-S, which is a Society of the IEEE. Societies are subgroups of IEEE that reflect areas of interest. There are a myriad of Societies, ranging from amplifiers to robotics and from nitty-gritty consumer electronics manufacturing to extremely esoteric academics.

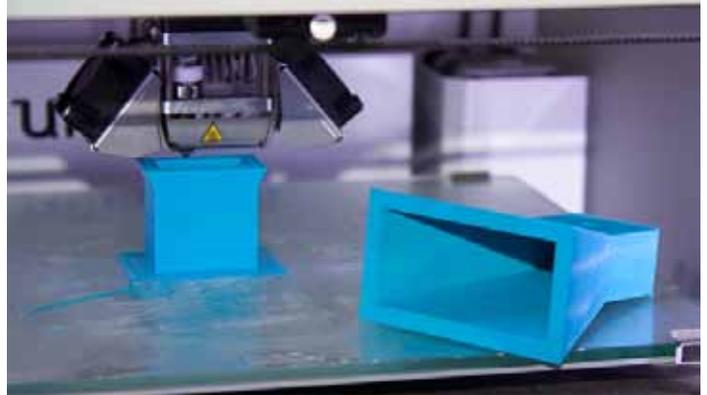
MTT-S stands for Microwave Theory and Techniques, and as the name implies, is focused on the microwave band. To make it even more complicated, Radio and Wireless Week (RWW) is not one but four "topical conferences" happening at once. Silicon Monolithic Integrated Circuits in RF Systems (SiRF), Power Amplifiers for Radio and Wireless Applications (PAWR), Wireless Sensors and Sensor Networks (WiSNet), and Biomedical Wireless Technologies, Networks, and Sensing Systems (BioWireleSS).

My interest in going to the conference was to find out more about 3D and 2D circuit printing techniques, software defined radio, and six-port structures. While those elements were compelling and challenging and made the event well worth attending, an added dimension unfolded over the several days as it became evident that a number of the speakers and presenters were amateur radio operators. Their perspectives were informed in various ways by amateur radio, and they all made efforts to communicate their membership in amateur radio.

The first day of the conference was devoted to workshops. RFID, 5G, and Power Amplification were on offer, but I attended "3D Printing and its Impact on Wireless Systems". Based on the content and the contacts met during the workshop, I went home and 3D printed a horn antenna structure for 10GHz amateur microwave. I found the model on Thingiverse (8 to 12 GHz Horn antenna with Coax-Waveguide Transducer by kodera2t, published May 12, 2013 <https://www.thingiverse.com/thing:87574>).

I elected to use PLA filament, and metallize with

conductive spray paint. The choice of conductive spray paint was recommended by Frank Brickle AB2KT. A hole for SMA fixtures was built into the model.



*3D printed 10GHz horn structure*

At the workshop, Dr. Nuno Borges Carvalho of Universidade de Aveiro, Portugal, discussed how his graduate student glued copper foil to a 3D-printed plastic model. They were now pursuing 3D printer companies to incorporate metal into their printers in order to more easily make microwave feeds.

While amateur radio didn't come up during this workshop, the application to 10GHz amateur radio was immediately evident.

Bright and early the next morning, Jeffrey Pawlan WA6KBL presented as part of the RWW Distinguished Lectures series "An Introduction to Software Defined Radio for Engineers". Jeffrey defined SDRs, gave a brief overview of their history, and categorized their evolution in easy-to-understand stages. During the live demonstration, he started WINRAD, and then used a recording of the 40m band made during a CQ World Wide contest to show the amazing agility of SDR filters and tuning. He then showed a live demonstration of distributed SDR by contacting his home machine in San Jose over the Internet. This machine continuously samples the entire 20m band and provides a digitized stream to the Internet. The laptop on the podium in San Diego was then used to demodulate and manipulate the data stream in real-time. Jeffrey showed how SDRs really shine in their ability to be configured in real-time to receive and present data streams.

One of many memorable slides was of a 16-pole analog IF crystal filter from Hiberling. Jeffrey properly framed this amazing filter design as

a real work of art. The 30 or so crystals were likely handpicked. The frequency response was presented, and it was quite lovely. Then, Jeffrey showed what a modest amount of code could do, running on a general-purpose processor. It was the exact same curve. Except, with input from the user running any one of a number of software programs, the curve could be changed, adapted, and redeployed.

Can the Hiberling filter change center frequency? Bandwidth? No. It cannot. It is frozen in place. This is not to say that lovely filters and advanced analog electronics don't have an extremely important place. In fact, there were several moments in the BioWireleSS sessions where the opposite point was driven firmly home. However, in the realm of human-centric communications, and especially in application like amateur radio, SDRs completely overwhelm the competition.

During Q&A I asked Jeffrey for his comments about FLEX Radio. He was disappointed that they had closed the source to their radio, was very impressed with the receiver, and less impressed with the transmitter. As several PARC members have noted in the days following the conference, FLEX has opened up an applications programming interface (API) for their source code, which allows people to access the radio functions without revealing the source code that implement those functions.

The next day, halfway through a long slog of math and thinking, was a presentation on "A New Multiple Antenna Port and Multiple User Port Antenna Tuner" by a man named Frederic Broyde . The host of the session stumbled over the strange letters in Frederic's biography and apologized for his unfamiliarity with the strange code. The letters were F1OYE, which was obviously a ham callsign from France! Frederic's talk was about his ideas on a tuner that would control an impedance matrix that would successfully match multiple radios to multiple antennas, in the form of a multidimensional pi network. Frederic spoke a lot about the capacitors in the pi network, so I asked him during the Q&A about the lonely inductors. He described them as being somewhat free to choose, of course "within limits". After the talk, Frederic educated the session chair in generous spirit about amateur radio and licenses and call signs. It was obvious how proud Frederic was of his call and the role it played in his personal and professional life.

I have no doubt that there were other presenters and attendees with amateur radio licenses. Whether currently active as hams or not,

amateur radio was an unexpectedly prevalent theme at an important international microwave engineering conference.

This caused me to reflect on the role amateur radio has had on my own personal and professional life. It's easy to see how amateur radio affected my choice to pursue engineering and science. What may not be quite as obvious is how it supports my decision to continue to pursue engineering and science. Amateur radio provides a place to experiment and socialize and learn in the face of substantial challenges. It's an important factor in my ability to continue to contribute to the art and science of radio.

Our access to the bands and our ability to get a license to experiment and serve the public is very important. The insatiable appetite from for-profit corporations for bandwidth continue to be a direct threat to the ability for ordinary people to access spectrum. Being able to access spectrum is necessary in order to learn advanced electronics, develop the skills to protect and serve the public during disasters, and to share the skills during ordinary enjoyable events such as parades, races, and other large gatherings. It's easy to see that organizations like IEEE would be much poorer and have diminished effect without a strong amateur radio community. This is why it's so important to be a good representative of the amateur radio service. Let your representatives know today what your license means to you!



*Interested in attending in 2016? RWW will be in Austin TX in late January.*

*An amateur radio conference*



Main tower in the snow. No damage observed.



Tower Trailer under a blanket of snow. Frozen spiderweb.



Oddly shaped snow structures on all the buildings from wind.



How deep was it? Snow covered chairs on walk to repeater site.





Looking south from the site.



KK600Z snow angel.

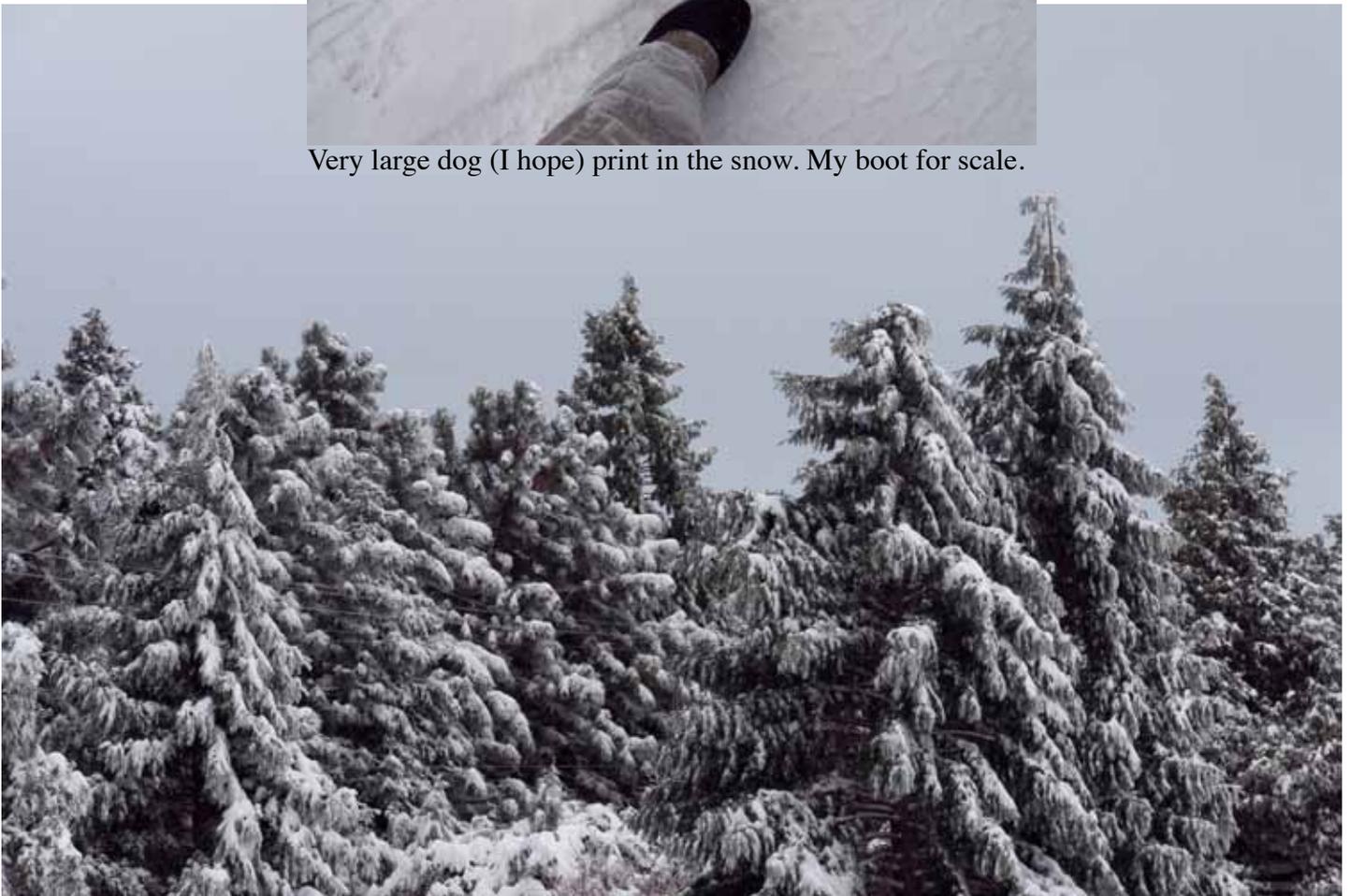


Snow covered cars in driveways along the walk





Very large dog (I hope) print in the snow. My boot for scale.



The snow was beautiful.



True southern California living involves lots of optimism. And adaptability. Just in case, this guy has his canoe on hand.



Winterize! If you didn't heed the advice already, then by this weekend, it was too late.



Repeater site was visited on New Year's Weekend, 2015 in order to inspect for damage from an 18" snowfall. W5NYV and KK6OOZ hiked down from Birch Hill and found the site in excellent shape. Photos by W5NYV.

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Gates Open for Camping Thursday, 2 pm Vendor Setup Friday, 7 am - Noon	Event Hours Friday, Noon - 5 pm Saturday, 8 am - 5 pm	Hamfest Dinner & Grand Prize Drawing Saturday Night 6:00 - 8:00 pm
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## GORDON WEST

10:30 a.m. • Keynote

America's leading ham radio educator, Gordon West, WB6NOA, will give our keynote address. Gordon is the author of numerous books and audio lessons on ham radio licensing and is well known for his sparkling, humorous and informative presentations.



## ANDRE HANSEN

11:30 a.m. • Broadband Hamnet

This presentation will provide an overview of the Broadband Hamnet project, featured in the July 2013 issue of QST. Andre will highlight the technology concepts, network designs and implementation, of this fast-growing emergency communications technology.

## DENNIS KIDDER

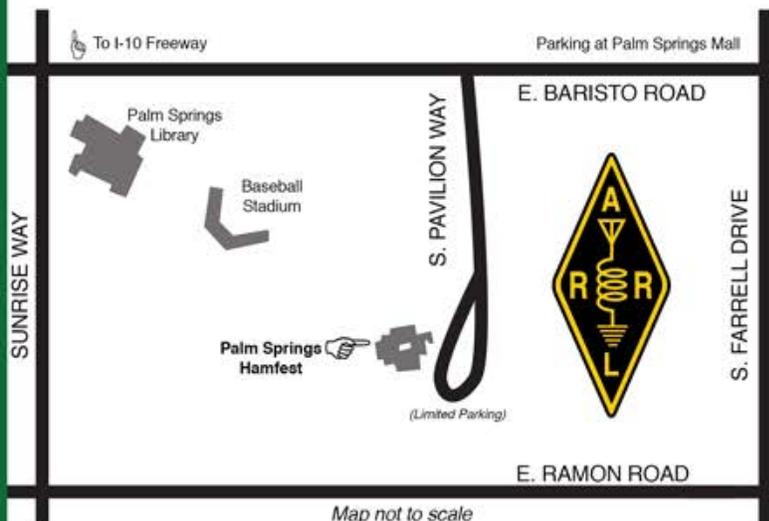
12:30 p.m. • Maker Faire

Dennis explains Maker Faire as: "The Maker Faire Experience is Bringing Ham Radio to a new community. Have you heard of the Maker movement? It is becoming a Renaissance of hobbyist electronics."

## BOB BREHM

1:30 p.m. • Curing RFI & Working more DX

Bob (AK6R) is Chief Engineer at [www.Palomar-Engineers.com](http://www.Palomar-Engineers.com). He'll be speaking on Curing RFI and keeping your neighbor's happy!



## VE TESTING

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# Club HF Remote Station? Let's Install One!

There are at least three reasons for the club to get involved in the HF remote movement. The first one is technical. The challenge of making a quality remote installation is fun and rewarding. The project involves backhaul establishment, HF equipment selection, remote access protocol development, command channel identification and establishment, testing and tuning, documentation, and training, among other things.

Secondly, autopatch and casual repeater usage has declined due to the increase of cellular coverage. Exploring new services that can be offered from club equipment on the Palomar Mountain property is an important responsibility. A new broadband repeater has been installed, and fresh hardware for the voice repeaters is under active investigation. Adding an HF remote station would expand the services provided by the club. This is an exciting time to get involved with renovating equipment on the site.

Third, many members are negatively affected by CC&Rs and other limitations on putting up HF antennas on their San Diego properties. We live in an urbanized area where antennas may or may not be allowed. Plenty of us live in valleys or in places that are not good for radio. Having a remote station that members can reserve and use would go a long way towards making the hobby possible for people that live in places where radio is limited.

If you would be interested in helping explore a club remote HF station on Palomar Mountain, then please join up by writing me at [scope@palomararc.org](mailto:scope@palomararc.org).

This special interest group for HF remote will write a proposal for the Palomar Amateur Radio Club board of directors to vote on. If the vote is successful, then fundraising will begin immediately.

<p><b>HAM RADIO OUTLET</b></p> <p>Jose XE2SJB Jerry N5MCJ Joe N6SIX</p> <p>H R O</p>	<p><b>KENWOOD rf CONCEPTS DIAMOND US TOWERS KANTRONICS YAESU, MFJ, ICOM BENCHER, Inc. HUSTLER COMET AMERITRON</b></p>	<p><b>Astron, AEA, OUTBACKER Larsen Antennas TEN-TEC Hy-gain, Tri-EX, Cushcraft And Others too Numerous to Mention!</b></p>	<p>Drop in to see our display of working equipment. Find out about Pkt location determining equipment (APRS). Check our complete line of magazines, ARRL books, license manuals, and Bulletin Board with all sorts of Goodies listed.</p>
<p>Open: 10a.m. – 5:30p.m. Monday thru Saturday <i>Ask about our great prices</i> 858 560-4900 or toll free 1-800-854-6046</p>	<p><b>Directions:</b> On 163, take <b>Clairemont Mesa Blvd.</b> off ramp to East. Stay in right-hand lane. Turn right at stoplight. As you are turning right you can see our beams in this shopping center. Travel 100 yds. On Kearny Villa Rd. and U-turn back to shopping area and HRO sign. Be sure to see our equipment in action on <b>real</b> antennas!</p>		

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# HF Remote on Palomar Update

by Michelle W5NYV

We continue our investigation into a remote HF station for Palomar Amateur Radio Club use with comments from those that have responded to the call for membership in the special interest group (HF-SIG). A big thank you and welcome to Howard KY6LA, Rob WA3IHV, Mace KG6VMF, Roger AD5T, Ken Easton, and Lou KW6Q!

The Ham Radio Lunch Bunch meets Fridays for lunch and socializing at any one of a number of restaurants on a rotating schedule.

The Lunch Bunch signup is

<http://w0ni.com>

Reminders are sent out on Wednesdays.

All are welcome for food and fun!

Some of the restaurants on the schedule are Fuddruckers, UTC Food Court, Spices Thai, Savory Buffet, Denny's, Callahan's Pub and Grill, and Phil's BBQ.

# Terrain Profiles Automated

by Howard KY6LA

Stu K6TU has automated the process of generating terrain profiles for use with N6BV's HF Terrain Analysis (HFTA) program.

To support HFTA's modeling, a user must first obtain a terrain profile which describes the height of terrain around the antenna location. This process is cumbersome and time consuming as the source of the data must be located, downloaded, then processed with MicroDEM.

Terrain Profile Requests are available to any user with a registered account on K6TU.NET at no charge and no subscription to Stu's propagation prediction service is necessary.

Stu's site maintains copies of both the USGS National Elevation Dataset (for the United States) and the NASA Shuttle Radar Topography Mission dataset enabling fast turnaround of requests.

FYI – Stu K6TU also is the Author of the Supercheck Partial Files and the K6TU iPad Control for the Flex 6000 series.



Lunch Bunch at FuddRuckers on January 30th, 2015. Photo by Michelle W5NYV.

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PERIODICALS

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### Featured Program:

At 7:30pm on 4 February 2015, Palomar Amateur Radio Club will have a program. Ron K2RP and John N6KOI will present a program. We look forward to seeing you at the Carlsbad Safety Center, 2560 Orion Way, Carlsbad, CA. Arrive at 7:00 for socializing, and for the HF Remote Special Interest Group meetup.

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