Sierra Signals

Welcome to SFARC, Auburn, CA

P.O. Box 6421   Auburn, CA 95604   **March 2014**   http://w6ek.org   info@w6ek.org

At The Key of SFARC:

PRESIDENT
Tyghe Richardson, KD6MLH
tyghe@tjrauctions.com

VICE PRESIDENT
Dave Albright, NO6NO
no6no@pacbell.net

SECRETARY
Dennis Gregory, WU6X
wu6x@hotmail.com

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 162.2)
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

Calendar of Events

March 14th:
Club Meeting

March 17th:
St. Patrick's Day

March 29th:
Club Breakfast

May 3rd & 4th:
Diabetes Walk & MS Walk

June 28th & 29th:
Field Day

Inside this issue:

- *From the Mic*
- *Field Day Update*
- *SFARC Volunteers Needed*
- *Miscellaneous Radio – Coding & Ham Radio*
- *Board of Directors Meeting Minutes*
- *General Meeting Minutes*

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

From the Mic
By Tyghe Richardson – KD6MLH, President

LINKING 220MHZ AND 144MHZ

At the last meeting I reopened the discussion of permanently linking the club 220mhz and 144mhz repeaters. We had a short Q and A on this topic, and are going to continue the discussion at the next meeting. I encourage all members to think of the pros and cons and bring them up at the next meeting.

More activity is one of the main things that comes to mind as a pro for me. I have spent a lot of time listening to the club's 223.860 repeater and I hear very little activity; this is not a good thing. The FCC has already "sold" some of the ham 220mhz band. Use it or lose it, and I don't want to lose any more.

I personally cannot come up with any reasons not to have them linked. I look forward to discussing this topic at the March meeting, see you there.

~ Field Day Update ~

Our Field Day committee has been busy getting everything organized for our biggest event. We still have several things to iron out but so far what we have discussed is the possibility of 2 towers instead of 1. Al is going to work on a "Bobtail curtain" antenna for 40 meters. We all agreed that having a "gain" antenna on 40 meters could be the difference of winning or just placing. Carl will be working on getting some good high gain antennas for VHF. Bob 2 is working on an arrangement for parking RV's. Dennis has acquired a commercial router so we all have a stronger Wi-Fi signal for our logging. Robert will be in charge of the QRP station. We are going on the suggestion of Dick to have "band captains" for each band including GOTA, VHF, and QRP.

Another idea we have been kicking around is changing the dinner to Friday eve instead of Saturday eve. The committee is open to opinions on this.

We will be having a committee meeting once a month until field day is over along with the June meeting field day related. Contact me for info on the committee meetings. All are welcome to attend.

73,
Bob WE6C wotbob01@yahoo.com

SFARC Volunteers Needed

~ No experience necessary ~

The Club has been asked to provide radio support for 2 charity events in MAY:

The first is the **Diabetes bike ride in Rocklin and vicinity on Saturday May 3** and the second is the **MS walk in Folsom on Sunday May 4**. We have done both of these events in the past and have proven that we can accomplish them successfully.

The **Diabetes bike ride** is a challenging event for us. We will need to provide support for a net control station, 4 rest stops and about 7 support vehicles. The vehicle will be provided. We just need to have people with mobile 2 meter radios with a mag mount antenna and some way to power it – either a portable battery pack or a connection to the support vehicle's 12v system. The operators at the rest stops find it's easiest to take their own vehicles to the location. This is also an ideal time for inexperienced operators to come out to see what volunteering is all about. "Newbies" would be assigned to an experienced person so you would not be alone.

This event starts about 0645 and can last until 1600. We prefer to have enough volunteers to be able to have 2 shifts. For your participation you will be provided a meal and a T-shirt.

The **Folsom MS walk** will require about 6 operators with HTs and we have found that using 2 meter simplex works for the whole event. This is probably the easiest and quickest event we do. It starts about 0730 and is usually over about 1230. Again food and a T-shirt will be your reward for supporting the MS walk plus the satisfaction that you are helping a worthy cause.

If you are interested in participating in either or both events and/or have any questions please contact George, KG6LSB, by phone (530.888.0860) or email (kg6lsb@arrl.net).

MISCELLANEOUS RADIO
Coding and Ham Radio

A (7, 4, 3) Hamming Code Decoder

We've come half-way to a working Forward Error Correction system … we know how to generate the code words using a little slice of linear algebra, and we have a block diagram of a system that will generate those 7-bit code words from an incoming stream of data bits, 4 at a time. Now, all we need is some mechanism for receiving the 7-bit code words [over the radio perhaps], and reconstructing the original 4-bit data word. And, assuming that only one bit error occurs in any 7-bit block, we need a method to determine which bit that is.

$$\begin{bmatrix} 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Let's start with **G**, the generator matrix for our code. It has 7 rows, so the code word vectors it generates when I multiply it by the 4-bit data vectors will have 7 bits each. Now, lets temporarily remove rows 1, 2, and 4 so we end up with a square 4x4 matrix:

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

This matrix has 4 columns so I can multiply it by a 4-bit data vector, and it has 4 rows so it will produce a 4-bit vector. In fact, the result vector will be an exact copy of the data vector. Since you know how to multiply a matrix by a vector in binary, it's easy to verify this. A matrix like this has a name … it's an "identity matrix" and its claim to fame is that it reproduces whatever vector you multiply it by. It's exactly the same as multiplying a number by "1" in ordinary arithmetic, you get the same number. While this may seem useless information, it actually isn't.

What all this shuffling means is that those four rows of **G** simply reproduce our 4-bit data vectors in the 7-bit code words. Look at the table of code words vs data words. All 16 valid code words reproduce the 4-bit data block in bit positions 3, 5, 6, 7. The remaining 3 rows, the ones we pulled out of **G,** are the parity bits, and you'll notice that they are the only rows with more than one 1-bit. In fact, all three of them have exactly three 1-bits. Row 1 provides even parity for rows 3, 5, and 7. Row 2 does it for 3, 6, and 7, and Row 4 does it for rows 5, 6, and 7. Each row is covered by two of the three parity rows. For a simple code like our example, I can figure out **G** just by inspection – start with an 4 x 4 identity matrix and add 3 rows of parity bits such that each data row is covered by two of them. It's a bit like Sudoku. For more complex codes, I can call in the Math Dudes and they'll apply some additional linear algebra and come up with **G** for me.

OK, so far so good. At the receiver, we'll be receiving a stream of 7-bit code words and we want to extract from them the original 4-bit blocks. And, so long as no more than one error bit per 7-bit code word occurred in transmission, we want that error corrected.

Now, in binary, there are only two kinds of errors that can occur … a "1" becomes a "0", or vice versa. So, if I had some way to determine which bit was switched, I can fix it just by inverting that bit, another big advantage of binary codes. A fundamental part of mathematics is the fact that for every operation you can perform on numbers, there is another operation that will undo it.[1] If I add two numbers, the undo is subtraction. If I multiply two numbers, the undo is division. This is true in linear algebra too.

$$\begin{bmatrix} 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{bmatrix}$$

Here's a 7x3 matrix, which everyone denotes by **H** which you can think of as the "undo" for multiplying the generator matrix, **G**, by each 4-bit data block at the encoder. It is directly related to **G**, and if you have **G**, you can get **H**. Since it has 7 columns, I can multiply it by the received 7-bit vector. Since it has 3 rows, the result will be a 3-bit vector. Like **G**, **H** has a pattern, each of the rows has exactly four 1-bits. "And that helps, how?"

4 bits of the 7-bit codeword are simply the original 4-bit data block we encoded … <u>if no errors occurred</u> … and if we consider the 3-bit result of multiplying **H** by the received 7 bits to be a 3-bit binary number, and if it is zero, no errors occurred. There are 7 other possible combinations for that 3-bit result, 001, 010, 011,–> 111, and here's the cool part! That binary value is the bit number of the 7-bit received codeword that is in error, provided only one error occurred in transmission!☺ I just invert that particular bit and I've corrected the error. Now, that 7-bit received vector contains my 4-bit data block and it also contains the three additional parity bits and the error could have occurred in one of them. I don't care about them but inverting one does nothing so I keep the procedure simple … "Invert the bit

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1 Although there's no guarantee that the "undo" will be as easy as the "do" was.☺ If you remember, this is the basis for asymmetric cryptosystems.

pointed to by the 3-bit result, and extract bits 3, 5, 6, and 7."

That result from multiplying **H** by my 7-bit received code vector is called the "syndrome," I have no idea why, but in binary codes, it either points to the error bit, or it is unique to the error vector and you can use it to look ERRV up in a table. There are non-binary codes, the somewhat new digital modes JT65 and WSJT uses one class of them, and they are significantly more complex, and one reason is that you not only need to know the character block that is in error but you also need to know what value it should have since there are more than two values.

Like the encoder, I could decode with a table lookup. There are 128 possible 7-bit codewords, 16 of which are valid and 112 of which are not. I could have a table with 128 entries, each corresponding to one of the 128 combinations. The entries for the 16 valid codewords would contain zeroes. All the other entries would contain bit combinations that will transform the invalid codeword to it's nearest valid neighbor. If more than one bit was in error, the nearest valid neighbor in *n*-space will be the wrong one. That's how it goes in FEC. This will work, and like the encoder, for simple codes like our example, it works great. Memory is dirt cheap, we're only dealing with 128 possible codewords, and microprocessors and PIC's can do it in the blink of an eye. But, for more powerful [and thus more complex] codes, it rapidly becomes unwieldy. The method described above works for every binary code that exists.

Think back now to that graph a couple of issues ago. Here it is again. In general, bit error rate is inversely proportional to channel signal to noise ratio [SNR]. That is, as SNR decreases [signal gets weaker or noise gets stronger or both], the BER will increase, moving to the right on the horizontal axis in the chart. Exactly how they're related depends on the modulation technique, the data rate, the bandwidth of the signal, and the bandwidth of the radio receiver. But, regardless, as SNR goes down, BER goes up.

In the graph for the no coding case, the MAR starts to drop [i.e. I begin losing messages when the BER is at about 10^{-9} or so. Let's say that corresponds to a channel SNR of 12dB, or a signal that is 12dB above the noise. If the SNR goes lower, the BER will go up and I'll begin having communications failures.
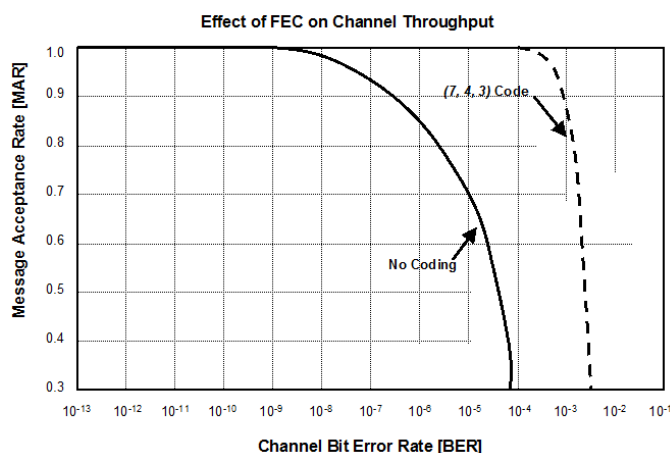
For the coded case, the MAR holds steady at 1.0 until the BER is at 10^{-4}, which corresponds to a much lower SNR, let's just say 4dB. Consequently, we can successfully communicate on a much lower quality channel … 8dB lower quality, in fact. That 8dB is termed "Coding Gain" because it represents 8dB in terms of radio channel quality. We could have used an 8dB better antenna, we could have transmitted with 8dB more power, or we could do neither and obtain the gain from coding. It's an 8dB difference regardless, so, coding gain, like other gain, is measured in dB. And, it is hugely significant in communications with far-away spacecraft.

I mentioned earlier that the dashed curve isn't really for our *(7, 4, 3)* Hamming code, numbers don't matter as much here as the shape of the two curves. The vertical axis [MAR] goes down to 0.3 … only 3 out of every 10 messages are arriving correct. Had I taken it all the way to zero [no messages are arriving correct], the two curves would be very close together, which is another fundamental characteristic of FEC. Coding will delay the degradation of the MAR at higher BER's [i.e. lower SNR's], but it doesn't change very much the point where nothing gets through

And a little coding trivia: The Hamming codes *(n, k, 3)* [a countable infinity of them] will all correct 1 bit errors per block. Every possible *n* and *k*, all the Hamming codes have *d*=3. They are members of the class of Binary Linear Cyclic Close-Packed [BLCCP] block codes. We know they're binary, they're linear because if you add any number of codewords [modulo 2, binary clock arithmetic], you'll get another codeword, they're cyclic because if you shift any code word any number of bits, left or right [end-around shift], you'll get another code word, and every codeword corresponds to one and only one data word. Most binary block codes do not have all of these properties.

In fact, there are no BLCCP codes that will correct 2 errors per block, and there is exactly one such code that will correct 3 errors per block – it's name is the *(23, 12, 7)* Golay code. And stranger still, there are no BLCCP block codes with *d* greater than 7. The dashed curve in the graph above is actually data for the one and only 3-bit Golay code.

73, and we're just about done with all this drivel,

Fred K6DGW

BOARD OF DIRECTORS MEETING MINUTES
February 14, 2014

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

Roll Call: All officers and Directors were present. Guest Toni-KK6JPJ was also present.

REPORTS and DISCUSSIONS

President's Report: Tyghe-KD6MLH renewed discussion on linking the 220 repeater with 2m full time. The Board agreed to bring the subject to the membership at tonight's meeting, but shelve any decision until the following meeting to allow thoughtful comments.

VP/VE Report: Dave-NO6NO discussed the results of looking into patches and hats with the Club logo. Prices were discussed and options for sale to the membership. VE: (26) candidates took (33) exams with (4) generals and (15) techs passing.

Secretary's Report: Dennis-WU6X waiting for an insurance certificate to formally request the Nyack site for FD2014. Richard has requested the cert. from our insurance carrier. Discussion on whether (2) portable toilets should be ordered this year. New FD software and "industrial grade" router working well; all laptops to be programmed before the event this year.

Treasurer's Report: Richard-WA6RWS reported net cash on hand at beginning of January of $5,549.91; expenses of $114.91; income of $1,017.04 and balance of $6,452.04. Delinquent members were

discussed; Richard will be turning follow-up over to Membership Chair, Ron-KK6DHJ.

Repeater: Richard – WA6RWS reported a request from Sweep Riders of the Sierra (SOS) to use the repeater on February 22nd from 10a to 2:30pm to test spots along the trail for future ride coordination. Richard also reported on investigation into reconnection of phone service at the repeater site; $39/month.

OTHER DISCUSSIONS

Discussion was held on the Club's interest or participation in a tour of Beale AFB, to be brought before the membership for interest.

Mark-W8BIT reported the need for a bar-b-q for Field Day; NO6NO volunteered to bring one. Mark also reported on an upcoming "preparedness event" at the LDS church on April 12 between Noon and 5pm..

Robert-W6RBL discussed White Elephant Auction and the possibility budgeting for a few "cheap" vhf/uhf hand-talkies for auction. The White Elephant Auction to be held on October 10th this year.

Jim-WA8NPA reported on refreshments planned for the meeting.

Meeting adjourned at 1845. Submitted by *Dennis Gregory-WU6X, SFARC Secretary*

GENERAL MEETING MINUTES
February 14, 2014

The SFARC General meeting for February commenced at 1930 hours at the Auburn City Hall Rose Room, President Tyghe-KD6MLH presiding. All Officers and Directors were present. Tyghe led approximately 40 members and guests in a Pledge of Allegiance to the flag followed by an introduction of Officers, members and guests.

REPORTS:
Past minutes: Minutes were approved as posted in the Newsletter on motion by WA8NPA and 2nd by N6BRP.

President's Report: Tyghe briefly discussed the agenda and then called for Officers' reports.

VP's Report: No report due to an emergency call-out for the PD repeater.

VE's Report: No report due to an emergency call-out to for the PD repeater (Note: see Board minutes for the VE report)

Secretary's Report: Dennis-WU6X requested input for the "events calendar"; a Welcome letter available for new members and guests, and a reminder to the membership to sign the attendance sheet.

Treasurer's Report: Richard-WA6RWS reported net cash on hand at beginning of January of $5,549.91; expenses of $114.91; income of $1,017.04 and balance of $6,452.04.

Satellite Report: Greg-KO6TH reported on the latest "Cube Sat" ventures.

Repeater Report: Richard-WA6RWS reported investigations into "kerchunking" but no solution found. Intermod from Rocklin is suspected, but not yet confirmed.

Sunshine Report: Richard-WA6RWS reported on recent losses in his immediate family. Our thoughts and prayers are with you Richard.

Refreshments/Drawing: George-KG6LSB reviewed items for the drawing, and Jim-WA8NPA reported on planned for the break.

OLD BUSINESS:

Committees: Tyghe reported Dennis-WU6X volunteered to Chair the Elections Committee.

NEW BUSINESS:

Repeater Linking: Tyghe-KD6MLH reported on Board discussion to again consider linking the 220 and 2m repeaters full-time. A few pros and cons were discussed, and the membership was asked to consider the action and be prepared to vote next meeting.

Field Day 2014: Mark-W8BIT gave a report of FD2014 Committee discussions and decisions. The Committee agreed to a "band captain" this year, and split up responsibility for site logistics (N6EMS), GOTA (K6UDA), and logging (WU6X). George-KG6LSB is handling the "facilities" and burn permit, and Richard/Dennis the insurance and Nyack permission.

Baofeng Programming: Dennis-WU6X brought his computer, software, cables, etc. to program member's Baofeng HT's during the break and after the meeting. At least 4 members took advantage of the service and Dennis plans to have this available next month as well.

Beale AFB Tour: A short discussion was held relative to a possible group tour of Beale AFB. No decisions.

Event Opportunities: George-KG6LSB reported on two events planned for 2014, the Diabetes Walk and MS Walk scheduled for May 3rd and 4th, respectively. Please contact KG6LSB if you are interested in participating in these great events. Mark-W8BIT reported on a planned "Preparedness Day" event at the LDS church at 287 Poetsmith Drive planned for April 12, Noon to 5pm. Contact Mark for more information. A crab dinner is planned by the American Legion to be held on March 1st and the Fairgrounds; contact Gene-KG6NYH for more details.

Repeater Use: We have granted use of the repeater to the Sweep Riders of the Sierra (SOS) to use the repeater on February 22nd from 10a to 2:30pm to test spots along the trail for future ride coordination.

Repeater Internet Access: Tyghe-KD6MLH presented board recommendations to re-connect Internet access at the repeater site. A discussion was held. A motion was made by Ron-KK6DHS, 2nd by Jim-WA8NPA to renew the internet connection; passed.

General Announcements: 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 on opposite Wednesday nights at 7:30pm. See W6EK.org for more information or date changes.

Presentation: Greg-KO6TH gave an excellent presentation on the history of amateur satellites and the various types of links and communications possible.

The meeting adjourned at 2120. Submitted by Dennis–WU6X, Club Secretary

SIERRA FOOTHILLS AMATEUR RADIO CLUB
P.O. Box 6421, Auburn, CA 95604

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SIERRA FOOTHILLS AMATEUR RADIO CLUB   **2014 MEMBERSHIP APPLICATION**
P.O. Box 6421, Auburn, CA 95604

Name: _____ Call: _____ Class: ____ e-mail: _____

Address: _____ City: _____ State: _____ Zip: _____

Associate Name: _____ Call: _____ Class: ____ email: _____

Phone: _____ Cellphone: _____ Application is: (Circle)   New   Renewal

Dues / Donations:

Membership: yearly*	$ 22.00	Name Badge:	$ 7.00	Yes (special name)_____
Associate: yearly*	$ 7.00	Repeater Donation:	$_____	
Auto Patch Donation:	$_____	Newsletter Booster:	$_____	
Misc. Donation:	$_____	Christmas Donation:	$_____	ARRL member? (circle) Yes No
		TOTAL:	**$_____**	**Please add $1 if paying via PayPal**

*Prorated dues for NEW Members/Associates Only

July	$ 20 /6	October	$ 14/3 + following year
August	$ 18/5	November	$ 12/2+ following year
September	$ 16/4	December	$ 10/1 + following year

Rev. Nov 2013