



Smoke Signals

Newsletter of Fullerton Radio Club

August 2026

President's Report

A few weeks back we did something a little different on the weekly net check-in and in honor of America's 250 anniversary. Members shared a place or landmark where they had a memorable visit. It was good to hear about the experiences. I found out Jesse James KM6TEZ shared the same place, the Statue of Liberty. I shared that from foot to crown the statue was about 80m. How's that for an amateur radio tie in?

We also have used the dual mode nets for testing skills on a different band, frequency or mode each week. The past couple of weeks we had good participation on both 6m and 10m FM simplex. I look forward to trying different ways for us to use our equipment, and also get to know our club members a little better.

Watch for an email survey later in August as we ask about your interests and capabilities with your equipment. We'd like to get a better picture of things as we bring back the Tuesday Ham Basics class and strive for more structured discussions on the Wednesday Zoom calls.

We'd also like to welcome new member Ed Roth N0NW to the group. Ed's been joining us for our weekly meetings as well as at Hillcrest Park.

Speaking of Hillcrest Park, this month we had six at the park working with UHF/VHF handhelds and trying out repeaters in the area. Here's a photo of all who joined, plus Walter Clark and his friend dropped by as well. Shown in the photo are myself K6RAX, John Mock K6AHY, Greg Hastings KO6DOM, Dick Palmer WB6JDH, Greg Chang KD5HIZ, and Brooks Kachner W6BJK. Also, while there I was able to confirm an APRS beacon off the International Space Station using their temporary frequency of 437.825 MHz. We welcome all members to these activities.

Ray Rounds, K6RAX
President



Fullerton Radio Club
P.O. Box 545, Fullerton, CA 92836

Board of Directors

President

Ray Rounds K6RAX

Vice President

Bob Houghton AD6QF

Secretary

Ted Schulman KO6FKX

Treasurer

Gene Thorpe, KB6CMO

Members At Large

Walter Clark

Robert Gimbel KG6WTQ

Larry McDavid W6FUB

Bart Pulverman WB6WUW

Volunteers

Membership

Bob Houghton AD6QF

T-Hunt

Joe Moell, K0OV

<http://www.homingin.com>

Email: homining@aol.com

W6ULI License Trustee

Albert Solomon, AG6OF

Newsletter Editor

Bob Houghton, AD6QF

Groups.io List Manager

Larry McDavid, W6FUB

Club Contact email: AD6QF@ARRL.ORG

FRC August 5, 2026 Board Meeting Minutes

The monthly FRC Board Meeting was called to order by President Ray Rounds K6RAX at 5:34 pm on Wednesday, August 5, 2026 via Zoom and by motions from Bob and Larry.

Board Members Present: Ray Rounds K6RAX, Bob Houghton AD6QF, Walter Clark, Larry McDavid W6FUB, and Robert Gimbal KG6WTQ

Board Members Absent: Gene Thorpe KB6CMO (on leave), Ted Schulman KO6FKX (excused), and Bart Pulverman WB6WUW.

The July Board Meeting Minutes were approved by consensus without corrections.

Treasurer's Report:

New deposits: \$20 (Greg Chang membership), plus \$0.02 interest

New expenditures: None

Bank balance: \$5,523.55 as of the July 30 bank statement

Membership:

New members: Greg Chang KD5HIZ

Renewals: None

Bob's records show 36 paid members plus 1 life member = 37 members as of 7/31/26.

Old Business:

Ray mentioned the successful POTA hunt for Bob from July 20 with four participating.

New Business:

Ray mentioned an upcoming membership survey of radio skills and equipment to help set up future training.

The group reviewed the K6QEH repeater and possible future options TBD.

Ray mentioned the upcoming Hillcrest Park activity on August 8 covering UHF/VHF and handhelds.

Next meeting: September 2, 2026, 5:30 PM via Zoom

There were no further items brought forward and the meeting was adjourned at 5:59 PM after motions by Walter and Bob.

Submitted by Ray Rounds, K6RAX

Want to join or renew?



OR:

Go to fullertonradioclub.org
and click on Join/Renew

Intermod 101, or Busting the Repeater Grunge

by Joe Moell K0OV

Over a hundred DXers and VHF-FM enthusiasts made up the Hughes Fullerton Employees Association (HFEA) Amateur Radio Club in the 1980s. Some of us enjoyed taking our lunches up to the club hamshack to eat while we looked for new countries on HF or worked on the club's two-meter repeater, K6QEH/R on 146.97(-).

Shortly after the club did some antenna work, a problem arose. Every evening, the repeater would begin transmitting a howling sound and some muffled scratching noises. Sometimes the noise would just break in and out intermittently. At other times, it would hold up the repeater until it timed out. As soon as someone keyed up the repeater again, the cycle would begin anew. Heavy rain would make the problem go away for a day or so, but then it would come right back.

Carrier access for open repeaters was the norm at that time. Only private repeaters had full-time subaudible tone ("PL") access. The club considered going to tone access, but that would only have covered up the problem. The grunge would still have QRMed weak signals.

Audio howl and lockup of the repeater were clues that intermodulation was involved. This phenomenon, usually called "intermod" for short, occurs when two or more signals on different frequencies interact to produce signals on additional frequencies that are related mathematically to the original signals.

This interaction is normal and desired in analog superheterodyne receivers. For instance, when tuned to an FM broadcast station on 91.5 MHz, a local oscillator in the receiver generates an unmodulated signal on 102.2 MHz, from which the 91.5 MHz signal is subtracted to produce a 10.7 MHz intermediate frequency (IF). The IF signal is then band-pass filtered, amplified and detected. The subtraction takes place in a non-linear stage called a mixer. In a well designed receiver, all other mixing products (such as the 91.5 + 102.2 MHz sum) are filtered out. The mixer is (or at least should be) the only non-linear stage in the set.

If mixing takes place where it shouldn't, unwanted intermodulation interference occurs. Transmitter finals and receiver inputs are supposed to be linear,

but sometimes improper tuning or incorrect device bias conditions will introduce nonlinearities. The result can be serious. An example is a case in Ohio some years ago in which the strong signal from a TV broadcast transmitter went down the coax into the final stage of an FM broadcast transmitter at the same site. Intermodulation products were created and amplified in the FM transmitter, then radiated to cause widespread interference that affected aircraft band communications.

When nonlinearity produces harmonics as well as sum/difference products, many more unwanted frequencies will be generated. For instance, here's what could happen if repeaters on 146.79(-) and 147.39(+) shared the same site and severe intermod occurred:

$(2 \times 146.79) - 147.39 = 146.19 \text{ MHz}$
 $(2 \times 147.39) - 146.79 = 147.99 \text{ MHz}$
 $(3 \times 146.79) - (2 \times 147.39) = 145.59 \text{ MHz}$
 $(3 \times 147.39) - (2 \times 146.79) = 148.59 \text{ MHz}$
...and so forth

Any of these products could cause QRM if radiated. Even at very low level, the 146.19 product would lock up or severely desensitize the 146.79 repeater. Similarly, the 147.99 product would lock up the 147.39 repeater.

From the audio howl and lock up of the K6QEH repeater, it was clear that the transmitter output was mixing with another signal (or signals) to create a spur on the input frequency. But what other transmitters were involved? Where was the mixing taking place? Usually when two signals mix in this manner, you can hear the audio of both at the same time, so why not in this case?

A few minutes with a calculator showed that signals or harmonics of signals on 147.57, 146.67, 147.27 and some out-of-band VHF frequencies could mix with the fundamental or harmonics of 146.97 to produce a signal on the input. But signals arriving on these frequencies weren't strong, weren't continuous, and weren't dead carriers. Careful checks with a dummy load and spectrum analyzer showed that there were no spurs from the transmitter on or near 146.37 MHz. So the receiver antenna had to be picking it up from an external source.

Perhaps my mobile transmitter hunting gear could detect and locate the mix signal. With the transmitter locked on and the repeater howling away, I drove slowly through all parking lots of the

300-acre facility, trying in vain to pickup a signal on the input with my 4-element direction-finding quad. No luck.

Apparently, I needed to get the RDF gear closer to the repeater. A visit to the Security office and some fast talking produced a letter of permission to bring my T-hunting vehicle inside the gates. Nobody told the Security officers, however. As I drove up and stopped right in front of the gate in my van bristling with antennas, I think it was instinct that made the guard's hand move toward his weapon.

After some more fast talking, I got the van and gear inside, where the grunge remained elusive. The only traces of 146.37 MHz signal were coming from the direction of the ham club's rooftop station. This signal got slightly stronger as I drove to the side of the building under those antennas. But was that weak carrier really the grunge signal, or was it just a birdie in my receiver caused by the very strong signal on the output?



VIEW FROM THE BUILDING 606 ROOF OF THE PENTHOUSE AND COLLINS LOG-PERIODIC ANTENNA. STANDING NEXT TO THE TOWERS IS KEVIN BALMFORTH N6ER (SK).

My conclusion from this experiment was that the grunge was coming from something in the ham shack or its antenna system. Unlike the hilltop communication sites occupied by many ham repeaters, this radio room was quite "clean" at the time. The only system in 24-hour operation was the K6QEH VHF repeater. The linked UHF repeater

hadn't been added yet and the company's two-way radio equipment was on another building. This rooftop had only the repeater antenna mast and the large log-periodic HF antenna on its towers.

This Collins Model 237B-1 log-periodic was the pride and joy of the ham club. Installed in the early 1960s for testing of Hughes' high-powered HF transmitters, its 13 elements had high gain from 40 through 6 meters. It was so massive that instead of being mounted on one tower, it was on a large-diameter mast supported between two wide 90-foot towers, rotated by a large motor from inside the penthouse. Slip rings rated up to 50 kW coupled RF to the antenna as well as AC power for the aircraft hazard lighting, so the mast could be turned continuously without stops.

In the late 1960s and early 1970s, this antenna had been connected nightly to a the club's Collins HF station on Military Affiliate Radio Service (MARS) frequencies. Volunteer club members (including FRC member John Mock K6AHY and myself) used it to run hundreds of "phone patches" to the families of Marine Corps servicemen who were stationed at undisclosed locations in southeast Asia.



FRC MEMBER JOHN MOCK K6AHY WITH SOME OF THE COMMENDATIONS RECEIVED BY THE HAM CLUB AT HUGHES AIRCRAFT IN FULLERTON FOR SERVICE TO NAVY AND MARINE CORPS MARS DURING THE VIET NAM WAR.

The original K6QEH/R antennas were separate vertical dipoles mounted on a side of one of the two big towers, but this created an unwanted directional pattern. So those antennas were replaced by a commercial monoband base station antenna on a 50-foot guyed mast nearby. A set of six duplexer "cans" was fabricated during off hours in the machine shop and were silver-plated for low loss.

To temporarily silence the howling lockup, I put a 10 dB RF attenuator between the duplexer and the repeater receiver input to reduce its sensitivity. For a few days, I ruminated about the "scratchy" characteristics of the grunge and how it seemed to change suddenly (for better or worse) around sunrise and sunset each day. Maybe the spur was not made up of heterodyning narrowband VHF FM signals.

If one signal were FM broadcast, its wideband modulation (+/- 75 KHz deviation) might sound scratchy on a narrowband (+/- 5 KHz) FM receiver. I took out the RF attenuation, opened the receiver squelch and strained my ears to try to get some intelligence out of the grunge. It wasn't music, it sounded like two people talking at once.

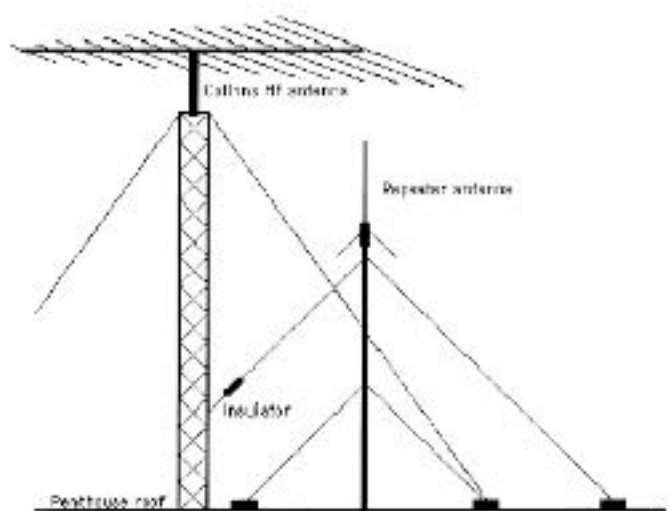
In those pre-Rush days, there was only one talk-radio station in the Los Angeles market, KABC on 790 KHz. Could that be it? I couldn't imagine how a 790 KHz signal could lock up a two-meter repeater with intermodulation.

To try to clearly copy AM signals coming through the narrowband FM repeater receiver, I tried something crude. The repeater receiver has an S-meter circuit consisting of a diode detector on the second IF stage, wired to a meter on the system panel. That diode ought to act as a rudimentary AM detector. I hooked an audio amplifier to the S-meter output and the sound of not just one, but two simultaneous AM broadcasts came plainly from its speaker. Quick comparisons with a pocket transistor radio verified that one was a talk-show host from KABC on 790 KHz and the other was a pastor's sermon from KGER (now KLTX) on 1390 KHz.

Now the mix equation was obvious:

$$146.97 - 1.39 + 0.79 = 146.37 \text{ MHz}$$

It was also evident why the grunge made sudden changes at sunrise and sunset. That's when many AM broadcast stations daily alter their directional antenna pattern and/or power output. But it still didn't explain where the mix was taking place and why broadcast-band signals were penetrating a tight VHF receiver input. So it was back to the roof.



THE COLLINS HF LOG-PERIODIC ANTENNA AND THE K6QEH REPEATER ANTENNA ON THE PENTHOUSE ROOF.

For direction-finding in the broadcast band, I used the pocket transistor radio and its ferrite rod antenna. Such sets are very directional when the rod is oriented horizontally. There are sharp signal nulls off the ends of the rod and broad peaks off the side. As I probed the penthouse rooftop with the radio tuned to either 790 or 1390, the strongest signal wasn't coming from the direction of the KABC or KGER towers, but from the heavy guy wires of those giant Collins towers.

The five guy wires coming down to the roof from the 50-foot mast supporting the repeater antenna had very little AM-band RF on them. A sixth guy ran from the top of the repeater mast to a spot about 10 feet up on the Collins tower (see the illustration). What if that wire coupled RF between the antenna supports? As an experiment, I disconnected that guy at the big tower attachment point, inserted an insulator, and re-installed it. The grunge was gone and never came back.

A grunge hunt can be just like a competitive hidden transmitter hunt, because you never know where you'll end up and you never know what you'll find. In this case, the two broadcast stations were not super-power (only 5 KW each) and not close (14 and 27 miles away). Nevertheless, long guy wires with AM-band resonances and a corroded connection or two were all that it took to create enough unintentional QRM to render a repeater nearly unusable.

The big Collins antenna stands no more. Building 606 was among those razed in 1994 to make room for the Amerige Heights Town Center. K6QEH/R was moved to one of the two remaining buildings on the old Hughes campus, which is now part of RTX.

As I Understand It

by Harish Kumar KO6FJT

Vertical or Horizontal?

The idea started with 'hunting' Bob during his Canadian POTA activations in the last few weeks. He has been traveling to many National Parks and activating POTA, giving us an opportunity to get in contact with him on the 20 meter band. As I had mentioned in my previous article, 20 meters is good, particularly during daylight hours.

When I first floated this idea with Ray (K6RAX) and Bob (AD6QF), Bob joked that it would be 'a very polarizing topic.' Ray countered that "it would resonate with several folks." Interestingly, they both are correct. Vertical or Horizontal polarization has implications on how the signals travel. Certainly, it would resonate with folks that have either or both type of antennas.

As experimentalists and hams, we would like to compare the two by testing. Let us explore what happened during our get together at Hillcrest Park to hunt Bob. Ray had hoisted a 20 meter horizontal dipole consisting of two hamstick antennas about 17 – 20 feet high and was transmitting at 100 W. I had a ground-mounted quarter-wave vertical telescopic antenna about 17.5 feet tall, with no Balun or Unun, but with 4 ground mounted counterpoise wires, and was transmitting at 50 W. Tom Smith (KB6A) was monitoring our transmissions from home and helped bridge the communications with Bob.

Greg Chang (KD5HIZ) also showed up and helped us in our experiments. Ray and I both could reach Bob on the 20 m Band. Bob said the second contact (using the vertical telescopic antenna) was giving a better signal at his POTA site. Tom mentioned that the telescopic antenna was stronger, by one to two S-units. Overall, the experiment was a success.

I was wondering why two different results? Same location, two different antennas. Both the horizontal Dipole and the telescopic vertical antennas had been tuned using an antenna analyzer to about 1.1 - 1.2 SWR. Could it be because the Horizontal Dipole was acting more like a 'Near Vertical Incidence Skywave (NVIS) antenna', meaning much of the radiation pattern would go vertical to the sky and bounce back to cover relatively shorter distances of about 400 to 500 miles, although it did travel to the POTA site more than 1000 miles. The telescopic vertical antenna has a radiation pattern with a low angle in the vertical plane and helps to reach longer distances with stronger signal. I have noticed a similar pattern with my horizontal random wire antenna at home. While I can hear stations in Oregon, but I am unable to transmit clearly to them in many instances from Fullerton, even at 100 W. I am not sure why. But I am sure the 'Elmers' in FRC will enlighten us.

73

Harish

KO6FJT
