

Natural Radio

News, Comments and Letters About Natural Radio

August 2000

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More Static and More Cats. The Canada fishing trip, sponsored by the fishing club at our high school, had finally arrived. About 4 PM on Saturday, June 17, our little caravan of dads, kids and teachers pulled out of the parking lot and began our 20 hour all night drive to Red Lake, Ontario. I was carrying considerably more radio gear than fishing gear. About 2:30 AM we pulled off the road for a couple hours of sleep near Pelican Lake, Minnesota. With great anticipation, I set up my receiver, stuck the antenna out the window, and put the headphones hoping for some activity before I drifted off to sleep. All that was audible was almost continuous sferics and a moderate amount of hum.

We arrived at our camp in Red Lake about 2:30 the next afternoon, and got settled in. Camp was quite muddy because it had rained every day the previous week. Although tired from the long drive, I pulled out the receiver that night to check things out and found that there was absolutely no hum audible. We were 10 or 15 miles from the nearest power line, and although the lodge in the camp had electricity from a propane generator, it produced no audible hum. Unfortunately, loud continuous sferics were the only thing I was able to hear. I tried listening from in the cabin, but the attenuation was just too much.

We fished all day Monday, the weather was great, I had the receiver in the boat but only sferics were audible. The clouds rolled in on Monday evening and Tuesday and Wednesday produced rain all day. The temperature was in the 60's so being in the boat with rain gear was fairly comfortable, but not conducive to natural radio listening or viewing of the aurora. Spring rains raised the lake level almost 2 feet and fishing was off this year, but we caught enough Walleye and Northern Pike for a good lunch on Wednesday.

The weather finally broke on Thursday with the sun coming in and out amid clearing skies. We were right at the Summer Solstice and about 300 miles North of the US border so at 10 PM it was still quite light. About midnight, with the glow of the sunset still visible in the Northwest, about 10 of us were sitting on the front porch of the cabin. One of the guys mentioned that he hoped we'd see some aurora on this trip, there hadn't been a chance yet because every night was cloudy. Not 10 seconds later someone in a group outside yelled, "Hey, the Northern lights are starting up."

We all rushed out to the shore and watched the thin blue-green curtains that were dancing in the North Sky. After about five minutes, I went inside and got out my receiver and recorder and returned outside. I put the headphones on and began recording. Again, all I heard was continuous sferics and a few tweeks. The auroral display climbed higher in the sky. Beams of light like light blue searchlights flashed occasionally across the sky. I explained to several people what I was listening for, and

a couple of the kids were interested enough to take the headphones for a while. The crowd thinned, and after about 45 minutes I was almost the only one left. By this time the display had moved overhead and down the dome of the sky to the South. Waves of light flashed overhead not unlike cloud-to-cloud lightning in a thunderstorm. At this point I became aware of a faint sound under the crashes of sferics. Yes. Chorus! I had thought it was a little late in the year for frogs, but that's what it sounded like. It was barely audible under the continuous crashing of sferics. I wonder what I would have heard if there weren't so many thunderstorms in the area! Standing under a flashing aurora and listening to it's effects was amazing. A half-hour later the aurora moved off to the West and the chorus faded away.

Now, if you are wondering about the "cats" in the title of this section... The next morning we maneuvered our boat into a creek, and were fishing near a small waterfall when a 70 or 80 pound lynx walked out of the woods and passed by less than 100 ft. away. This is one cat I don't want rubbing against my legs!

Lessons Learned in Canada Last month I mentioned Dave Laida's letter, and it speaks well to my experience in Canada with sferics being a limiting factor in reception. Dave is in the process of moving to Rome, NY from Arizona.

Your wish for a dedicated whistler in the Northeast will be fulfilled. My equipment is going into storage until my family can move into a permanent residence, thus I won't be able to hunt for quiet locations until this fall. After having great success in Southern Arizona, I hope that whistlers are not just a Western states' event!

My experience supports John Lauerman's contention that a VLF receiver's effectiveness is determined by local background noise. Between 300 Hz. and 10 kHz, strong sferics, more than power line noise, mask whistlers. You can't effectively filter or attenuate wide band sferics. Thus large dynamic range rather than just high gain improves the ability to hear whistlers buried in the lightning impulses. My best listening sessions have been when storms were very far away.

I also believe that many receivers are operating with too narrow bandwidth to receive whistlers with good fidelity. The McGreevy BBB-4 and Mideke RS-4 were designed to contend with Omega signals. Omega was shut down in 1997 yet I still see the "audio transformer" low-pass filter with a 7 kHz cutoff included. I'd say many receivers need to be opened up to 10 or 11 kHz. to capture the higher frequencies of whistlers. Some designs are using op amps in the low noise front end. Op amps with their active current sources are too noisy and the white noise hiss will mask weak whistlers. Front ends should be built with discrete transistors, and these held to a minimum number.

Having said the above, I know that incredibly poorly designed receivers are capable of detecting whistlers on occasion. Steve McGreevy said it right when he recommended whistler hunters get away from power lines and trees.

Dave's comments were foremost in my mind during the Canada trip. There I was in an area with no hum, and heard very little because of the pattern of thunderstorms that moved through the Midwest in June. Maybe that's why those of us in the Eastern half

of the country don't seem to have much luck hearing whistlers. That's not the end of the story. Dave's comments would soon be even more pertinent. Read on dear reader.

Whistler Storms and More Lessons Learned. On Thursday, July 13, the largest solar flare of the current sunspot cycle erupted and sent a Coronal Mass Ejection earthward. I was watching the data from the GOES Satellite on Saturday hoping for an auroral display that night and maybe some whistler activity. At about 2 PM the Planetary K index went off the scale and I grabbed my whistler receiver and recorder and headed for my quiet site. At that point all that was audible was the crashing of almost continuous sferics. I listened for a bit and returned home. We had plans for the evening with our good friends, Rich and Kathy. Rich is an amateur astronomer, so as we walked around the Lake Zurich summer Festival, we both kept an eye to the north sky. About 10 PM we were sitting on their back porch, and Rich and I decided to go out and look for aurora. Of course I had my receiver in the car so I pulled it out and started listening. We were about 75 feet from the house and there was almost no hum. The sferics were fairly heavy but after a few moments of listening I began hearing diffuse whistlers, some of them quite loud. Some of them were so loud that I could hear them when Rich was wearing the headphones! I was excited about the whistlers, but was more amazed by the low level of power line noise. In that neighborhood, the lots are about acre and the power lines underground. The noise level was considerably lower than at what I thought was my quiet site.

We got home about midnight, and I pulled out the receiver and went to the end of my driveway. The sferics were as loud as before, there were a few tweeks, but I only heard one weak whistler in about 15 minutes. I suppose it was possible that the whistlers had diminished, but I thought they would be increasing after midnight. I began to think something else was going on, and would investigate in the morning. I went in and set the alarm for 5:30 AM.

I was out the door by 5:45 AM. The receiver and recorder were still set up in my van and a quick check at the end of the driveway produced nothing but sferics and a few leftover tweeks. I pulled out and headed for a nearby park and found the gates locked. I tried a couple of other Forest Preserves that were supposed to be open at sunup, but all the gatekeepers had slept in on this fine Sunday morning. I finally made it back to the park near my house at about 6:45 AM. The gates were open so I pulled in and set up the receiver. This is not the most quiet area, there's about the same amount of power line noise as at the end of my driveway; but I could hear over the sferics a wind like sound going up and down, then chorus, occasional sounds like birds chirping, and finally diffuse whistlers. I recorded for about 20 minutes and then headed home. At the end of the driveway, all I could hear were sferics and hum, and at about the same level I heard in the park. What had happened to all the other stuff I was hearing 5 minutes earlier and less than a quarter mile away from where I was now?

Dave Laida's comments immediately came to mind. *Get away from power lines and trees.* Even though the end of my driveway is in the clear, there are woods across the street and trees to my right and left. I thought that because I could hear sferics and tweeks and because the signal level came up as I moved away from trees that I should be able to hear whistlers. Not so. I am assuming that the trees are attenuating the

weaker signals, but I assumed wrong before. There may be other factors going on, but nevertheless, I am going to find another site that is away from the trees. Thanks to Dave for reminding me.

With that lesson learned, I spent the next several hours driving to various forest preserves and parks trying to find a better listening site. I finally found a fairly quiet site only about four or five miles away in a small Forest Preserve. The nearest power line is about ½ mile away and the nearest High Voltage transmission lines are about two and a half miles to the West.

My receiver is performing well. The high end response is rolled off at 3db per octave above 10 kHz. This works well here, but if I were near any of the big Navy stations, more low-pass filtering might be necessary. I had problems with a defective potentiometer in Canada that was causing some oscillation, but I replaced it and performance is good. Taking Dave's comments and my experiences to mind, I am going to have another look at the front end. A little improvement in dynamic range and noise may mean the difference between hearing and not hearing whistlers. Also I may try some diode limiting to keep the sferics from frying my ears.

Later this week we are heading out for a camping vacation in New Mexico and Arizona. I hope to sample some of that good Western whistler listening that I've been reading about for so many years. In between listening I hope to sample some Southwestern cookery, also.

New Site for "RADIO WAVES Below 22 kHz" Renato Romero has a new, easy to remember, name for his VLF website: www.vlf.it. His E-mail address has changed also; it is openlab@vlf.it. This is a great site and worth a visit.

Fall Coordinated Monitoring. As promised, we will again do coordinated listening near the fall equinox. The dates are September 23 and 24 and September 30 and October 1. I'll publish a recap of the details next month. Find a quiet site away from the trees and get your equipment ready. With the thunderstorms and associated sferics moving out, and the high solar activity, this could be a memorable year.

Solar Activity We are nearing the peak of the sunspot cycle, and as last week indicated, geomagnetic storms can cause lots of Natural Radio phenomenon. My favorite website for monitoring solar and geomagnetic activity is the Space Weather site at <http://www.sec.noaa.gov/today.html>. This site shows solar flares and also geomagnetic activities from the GOES satellite which is in geosynchronous orbit around the earth.

NOAA has introduced a new site this month at the following address: <http://www.sec.noaa.gov/SWN/index.html>. This site has a synopsis of solar and geomagnetic activity and is also a gateway to much more information. It is worth checking out. If you don't have internet access listen to WWV (2.5, 5,10,15 or 20 mHz.) at 18 minutes past the hour. If the Boulder K index is above 7, head for your quiet site!

Your Much Appreciated Correspondence

•**Jim Stoughton, Seattle, WA** Jim sent in some more modifications to his “Poor Man’s Chart Recorder”. That article should be in the next issue. Jim writes: These schematics, Mark, I've recently sent you are but a few of many, many instruments I've built here in my now extensive lab over quite a few years. I have complete plans for pme as well as perhaps unusual circuits that I would like to share with you and your readers anytime.

As for sferic hunting I envy all you chaps who have means for transportation to relatively "quiet" sites for gear setups for listening- As I've perhaps mentioned before, my QTH is horribly bombarded by the mains beacon and most of its harmonics but also digital tv Sips and many other forms of manmade garbage. Many of my colleagues Steve Ratzlaff, Dan Levit, Brian Lucas, Flavio Gori, Robin Hughes, just to mention a few, I've been corresponding for years about VLF and ULF platforms. They've been kind and gracious to field test many of my loop type receivers of which many contained high, low pass as well as band-pass filters. I have most of them sitting in storage cabinets at the present time as can't use them myself due to my previous comments. Yes, my files are full of each receivers plans too. Would you like to be able to quite accurately measure resistance of up to IOK Megs and higher? Curve tracers up to over kV for non-destructive testing of most solid state devices, using even an inexpensive recurrent scope This is just a few pieces of test equipment I have on hand that I built years ago that doesn't cost an "arm and a leg" to build.

Natural Radio Log

Month Day	Time UTC	What Heard (whistlers/hour where applicable)	ID Grid Sq.
06/18	0730-0800	Heavy sferics, tweeks, moderate hum	MK-EN38
06/19	0300-0315	Heavy sferics, absolutely no hum	MK-EO21
06/23	0515-0545	Heavy sferics, aurora to north	MK-EO21
06/23	0545-0645	Heavy sferics, hiss and weak chorus - aurora overhead.	MK-EO21
07/15	2000-2015	Heavy sferics, geomagnetic storm Kp>10	MK-EN52
07/16	0330-0400	Heavy sferics, loud diffuse whistlers 3-4/min.	MK-EN52
07/16	1152-1215	Heavy sferics, hiss, chorus, risers, diffuse whistlers	MK-EN52
07/16	1300-1310	Heavy sferics, diffuse whistlers 1/min.	MK-EN52
07/16	1346-1406	Heavy sferics, diffuse whistlers 1/min.	MK-EN52
07/16	1445-1500	Heavy sferics, diffuse whistlers 20./hour.	MK-EN52

MK - Mark Karney, N9JWF, Barrington, IL. Equipment - Homebrew receiver with 60” whip, JFET front end and -24db/octave hi-pass active filter, 350 Hz. cutoff.