

Natural Radio

News, Comments and Letters About Natural Radio

December 2004

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Lots of Solar Activity on the Downward Slope – A few weeks ago I saw a news article that said that an unusual thing had happened -- there were no sunspots. This was unusual for this part of the solar cycle and some scientists were predicting that we might actually hit solar minimum about a year early. Then sunspot #696 appeared at the beginning of November. Activity picked up with 7 or more M flares and a couple of X flares.

On November 6 there was a long duration M7 flare that seemed to have an earth directed CME associated with it.

On Sunday, the 7th, I had a late afternoon recording session with the local high school choir to finish up their Christmas Album. I quickly checked my Email before I left work at about 6:30. I monitor the spacew.com list, and saw an unusually high number of messages from with aurora reports from Pennsylvania and other points east.

I immediately checked the NOAA Space Weather site I saw that the K_p was at 8, the solar wind was in excess of 600 KM/sec and the B_z part of the magnetic field had pinned the needle of the meter at -50 nT in the southward direction. An extreme geomagnetic storm was in progress! Amazingly, clear skies were predicted for the evening. I headed home hoping for an interesting evening.

Not much seemed to be happening in the Northern Sky, but I went outside about every 15 minutes to keep an eye on things. About 8:00 (0200 UT) the sky to the north looked a little green and I thought I could make out some upward streamers, but they were very faint. I went inside and called my friends Mary Rose and Mark to alert them to the fact that I could see the beginnings of an aurora. We have a pact to call each other when we see aurora, no matter what the time is. They were already outside and had the call transferred to their cell phone. I stuck the cordless phone in my pocket and went back outside. Things seemed to be fizzling out although I thought the sky to the north looked green.

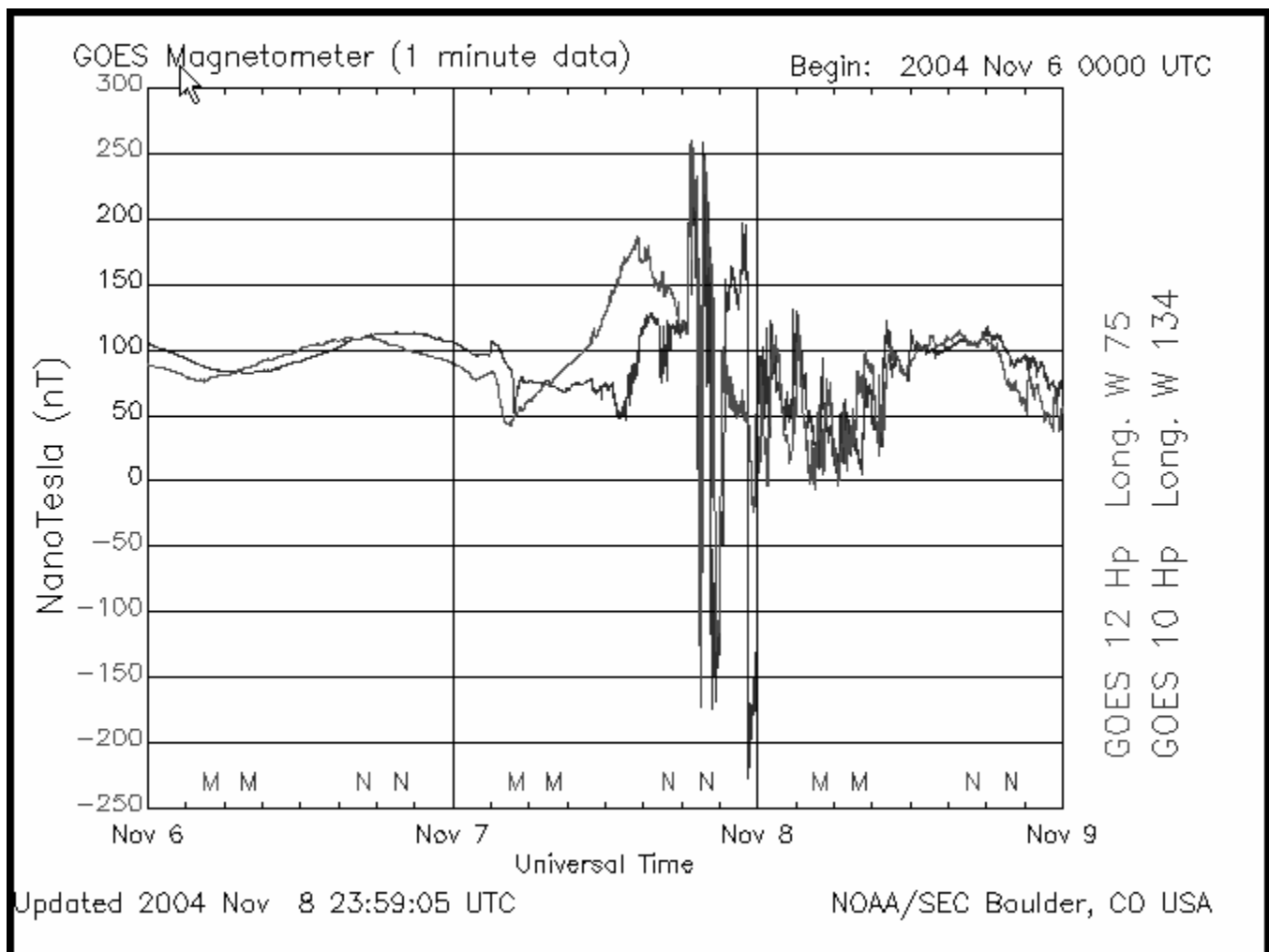
I had been in the house only about 5 minutes when Mary Rose called and said they were seeing a pretty decent aurora display. (They are about 6 miles NW of me in a little darker area and with a much better view of the sky.) I ran outside and saw the same thing with the sky lit up in the north and east with streamers glowing clouds. There wasn't a lot of color but the lights were quite bright and in a few minutes had moved upward and directly overhead. I can only imagine that the view from a truly dark area would have been more spectacular. I dragged my wife Natalie away from her comfortable position in front of the TV out into the cold night and called a few friends who I knew would be interested in seeing the Northern Lights.

When Natalie lost interest, I then decided to drive over to Mary Rose and Mark's since I knew that the viewing would be better there. I could easily see the lights from the window of my van as I during my drive. By the time I got there, the display had died down quite a bit, but we walked down to a small lake at the end of their street where we would have a clear view to the North.

After about 15 minutes or so we saw some activity and red color low in the north which rose quickly with the lights moving across the sky in waves. The display moved up and lit up the whole sky. There wasn't a lot of color, mostly light green to a light blue-white. After 45 minutes or so it was directly above us covering the sky from east to west. Reluctantly, we went in for some hot chocolate about 11:00 as the temperature was near freezing and we had been outside for a couple of hours.

I headed back home and the display quieted down again. By midnight the sky was quiet, but I kept checking and the lights started up again by about 12:30. This time it was a band of rapidly flashing light that extended directly overhead from the east to the western horizon. It reminded me of a summer thunderstorm in the distance where the cloud keeps lighting up and flashing from the inter-cloud lightning. I wrapped myself in a blanket and sat on the ground leaning back against the front porch and watched the awesome display until about 1:30 AM (0730UT) when fatigue got the best of me.

This was definitely the longest Aurora display I have ever witnessed. Sadly, most people I talked to the next week had missed it. Looking at the K_p after the fact, it registered a 9 between 0000 – 0600 UT. People were seeing the aurora as far south as Oklahoma and Arizona. Below is a graph of the GOES Magnetometer during the storm.

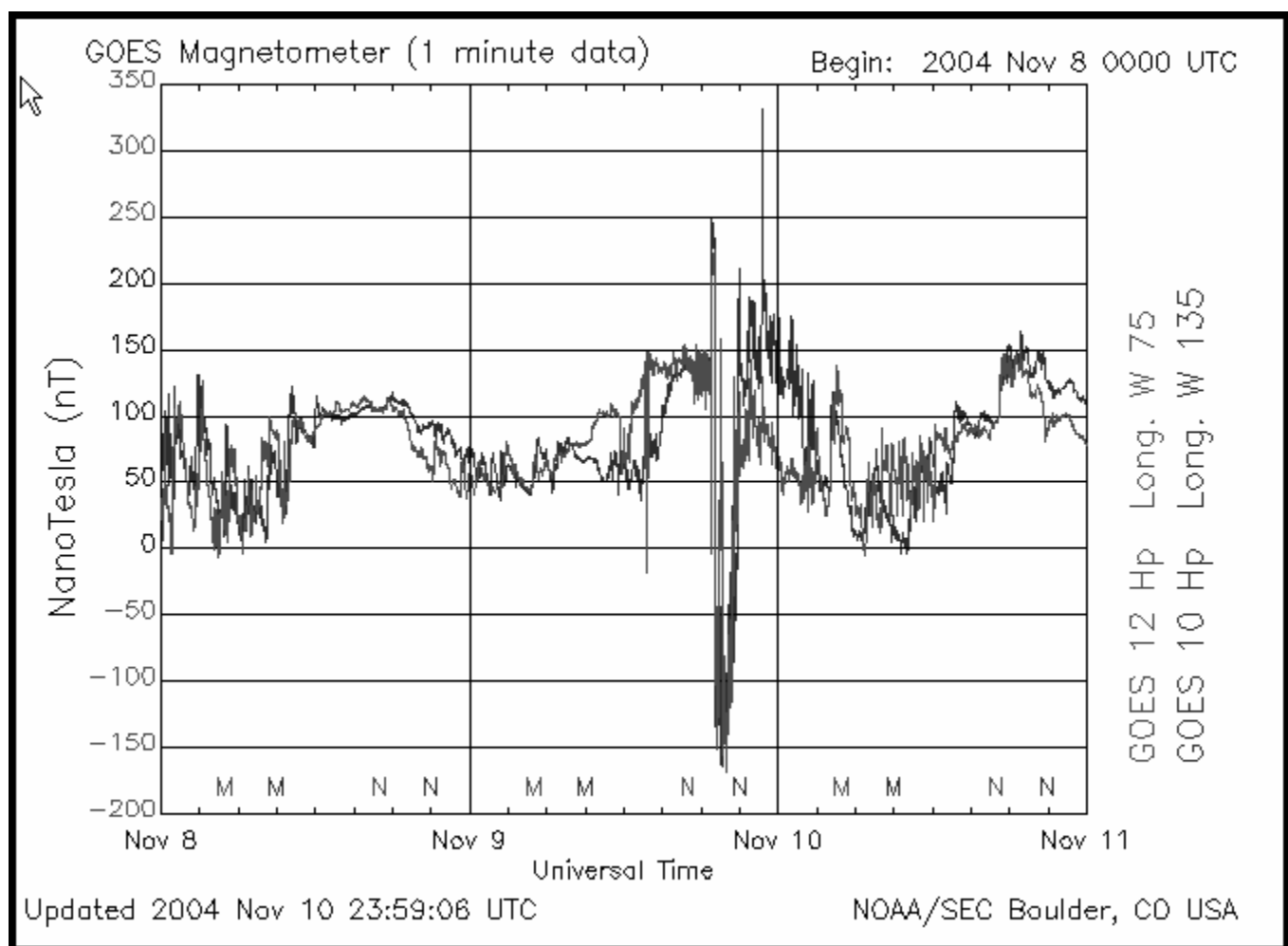


Monday morning I headed out to my quiet spot at the nature center just after it opened at 8AM. I recorded about 20 minutes of loud chorus that was quite consistent over the time period with little change in volume and character.

There had been an X flare on the afternoon of November 7, and another CME arrived on Tuesday afternoon. I went out that night as things looked promising, but just as the magnetic storming increased, the clouds blew in (as usual) so I went to bed around midnight without seeing anything. There were more aurora reports the next morning from the areas that were cloud free, but not as intense as Sunday night's. The K_p had registered a 9 between 0600 – 0900 UT.

Next morning the chorus was quite loud again at the nature center with pretty much the same characteristics as Monday morning. What was different was that I couldn't pick up time signals from WWV on any of the frequencies between 2.5 and 20 MHz. The short-wave bands were completely dead.

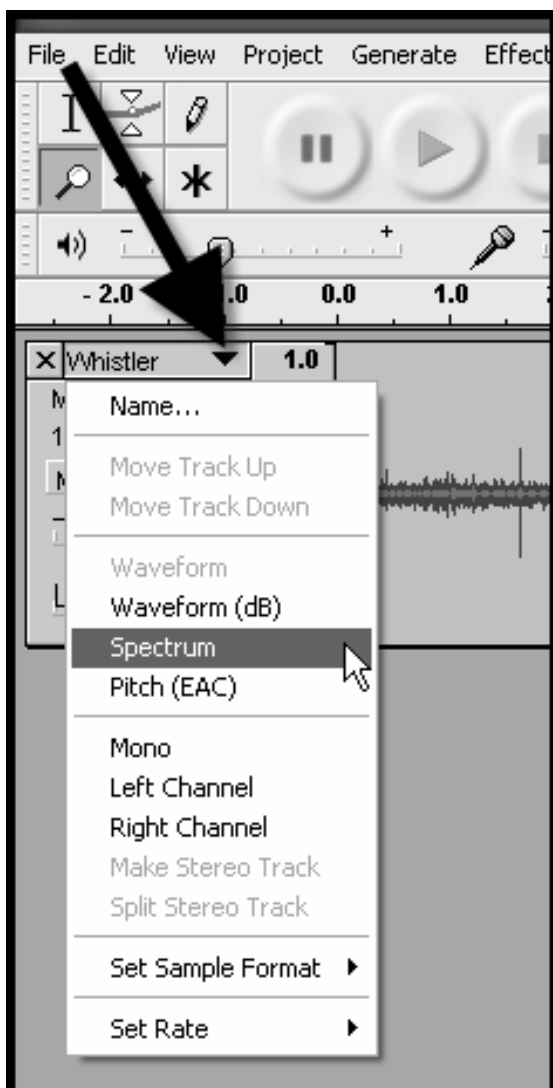
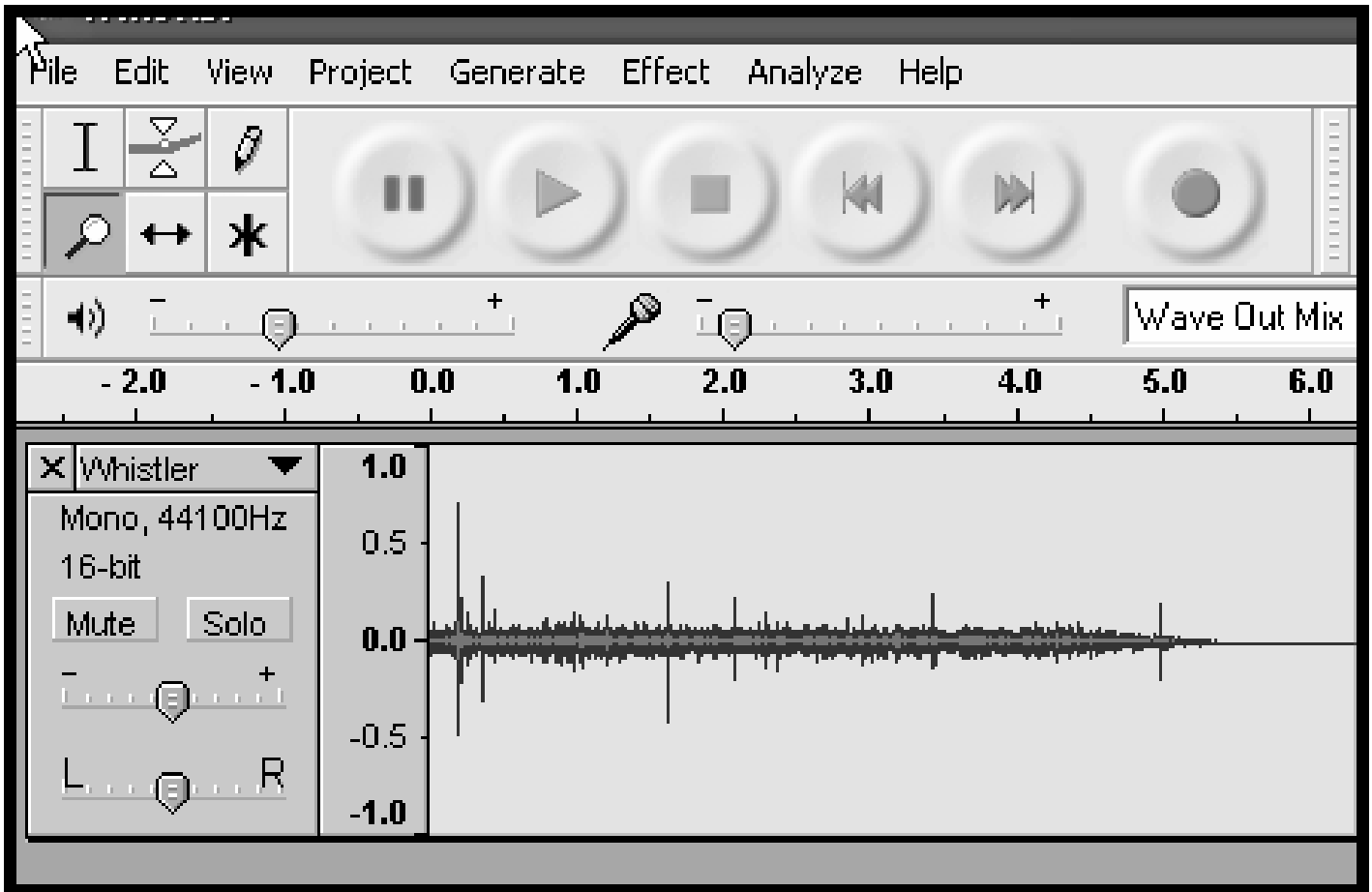
Here's the Tuesday graph.



I hope everyone had the chance to see the Northern Lights or do some listening during this latest storm. Northern Lights are a less rare phenomenon if you know when to look and what you are looking for.

Also, chorus seems to be less elusive than whistlers, at least in the Midwest and East. A geomagnetic storm with a K_p of 6 or greater will usually produce chorus or other VLF emissions, so it's worth keeping an eye on Space Weather even on the far downward side of the solar cycle.

More On Using Audacity – When I was testing the Audacity editing program a few months back, I had thought there was a feature that let you toggle between spectral and waveform display but I couldn't find it. After playing with the program this past month I found where it was hidden.



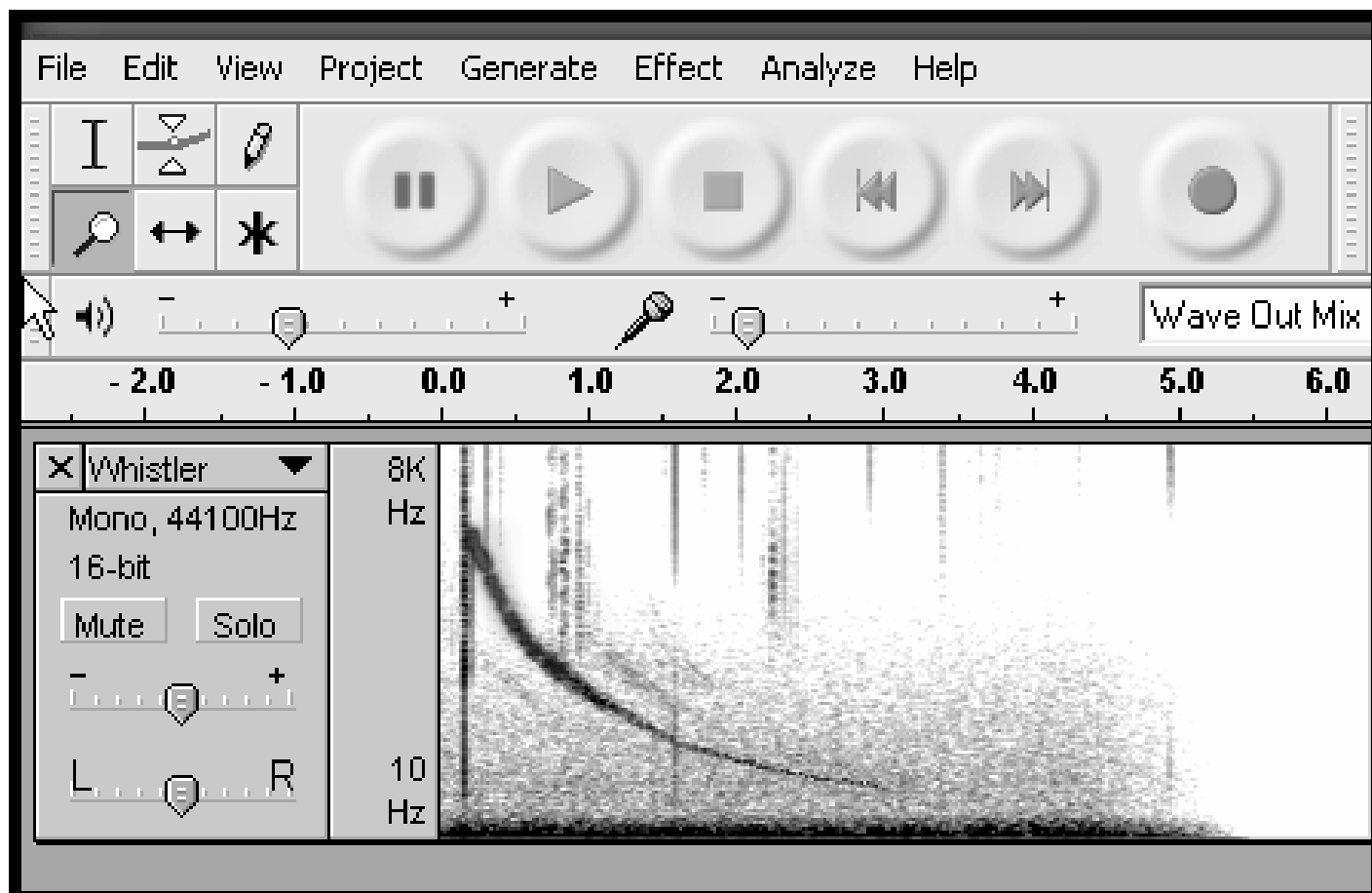
This is really a great feature because you can edit your files in either display format. This lets you visually pick out whistlers and other signals while you are editing and makes it real quick to pick out and copy the signals you want to save.

The picture above shows a whistler displayed in waveform mode. It's hard to tell that it's a whistler by looking at it.

If you look at the control panel next to the waveform display, you'll notice a little downward pointing arrow just to the right of the file name "**Whistler**". Click on this arrow and a drop down menu will appear that lets you select either **Waveform** or **Spectrum** display as well as other parameters as shown on the picture to the left.

As you can see in the next photo, the whistler pops right out. You can perform all editing functions in this display mode, so if you are going through a long file that you have recorded all you have to do

is click and drag over the whistler or other item of interest. Once it is highlighted you can copy and paste it to a new file and thus have short files of all items of interest. This is a really nice feature, especially for a free program.



If you go into the **Preferences** section of the program and look under **Spectograms**, you can set the FFT resolution, the upper limit on frequency and whether you want the display in grayscale or color.

The latest version of this freeware program, Audacity 1.2.3, was just released this week. This program has versions that will run under Windows 98 or newer, Macintosh, and Linux. Download the program at <http://audacity.sourceforge.net/>

Kits and Boards Available – On these long winter nights while you are listening for that elusive NDB, you are probably spending some time at the workbench, so here's some sources for project boards and kits.

Bill Pine mentions in this issue of *The INSPIRE Journal* that he has a few VLF2 INSPIRE receivers available at the close-out price of \$50 including shipping!. He also has some RS-4 receiver boards available for \$10.00 including shipping.

If you are interested, contact Bill at pine@mail630.gsfc.nasa.gov.

Another source for boards of interest to the VLF and Natural Radio experimenter is Far Circuits. Far Circuits has produced circuit boards over the years for many construction projects appearing in QST, 73, and other electronics publications.

The listing on the website for each project board includes the magazine and issue where the article was published, but there is really no other description of the project

other than the title. Therefore, it might take a little research to find out the details of the project. You can order reprints of the article with the board for an additional \$1.50.

It's worth spending some time looking through the listings, as having a circuit board makes construction a homebrew project much easier. Looking at this list is also an easy way to find a reference for project you may have read about a few years ago, but can't remember where you saw it. Here are some of the projects I found that might appeal to readers of *The Lowdown*.

- **VLF SPACE SHUTTLE RECEIVER**
- **JOE CARR VLF RECEIVER**
- **GYRATOR RECEIVER**
- **A SIMPLE 10MHZ WWV RECEIVER BY MCKEAN**
- **REMOTE TUNED ACTIVE ANTENNA/CORNELL (2 BD SET)**
- **CORNELL WIDE BAND RECEIVER AMPLIFIER**
- **CORNELL REGEN RECEIVER PREAMP**
- **AAVSO VLF RECEIVER PREAMP BY CARR**
- **AAVSO RECEIVER BY CARR**

There are also some audio amplifier boards that could be used as the headphone amp for a Natural Radio Receiver. If you are considering building a beacon transmitter, there are projects for automatic keyers and oscillators.

Check out the website at <http://www.farcircuits.net/> or contact them at Far Circuits, 18N640 Field Court, Dundee, Illinois 60118. The phone number is (847) 836-9148 for Voice/Fax.

Hessdalen – This month's *The INSPIRE Journal* had a great article about the history and research done to find the source of the strange lights that have been flying around the Hessdalen Valley in central Norway for over 100 years.

Scientific research began in 1983 during a peak period of sightings from 1982-1985 when the lights were seen daily.

Currently an automatic video recording system is set up in the valley. On the low frequency end, the researchers have used an INSPIRE VLF receiver, an ELFO extremely low frequency observer and a flux gate magnetometer. Many anomalous signals have been recorded that seem to be associated with the phenomenon, but none can be 100% associated with it.

In short, the phenomenons are still very elusive. Several theories have been formulated as to what these luminous objects might be but much more research needs to be done.

Read about it at the main Hessdalen site at <http://www.hessdalen.org>. Read the specific report about project EMBLA at http://www.hessdalen.org/reports/EMBLA_2002_2.pdf

Finally, as this year draws to a close, I wish you peace and joy in this Holiday Season.