Natural Radio

News, Comments and Letters About Natural Radio

October 2004

After an unusually cool summer, September has been the most beautiful month with daily temperatures near 80º and clear skies. The dry summer has not produced a lot of mosquitoes, and the yellow jacket population seems considerably smaller than in the past few years, so we've been spending the evenings and weekends outdoors.

While enjoying the balmy weather on the deck, I am still anticipating winter and have been thinking about projects for the time when the gardening and lawn mowing are over. This year, I am determined to complete a setup where I can do Natural Radio listening from home as my trips to quiet listening locations have been too few and far between. There are just no locations nearby that I can access during the prime evening hours.

In addition to designing new hardware and finding an appropriate location in my tree filled yard, software filtering to eliminate hum and its harmonics will be necessary. And while just plain listening is fun, I'd like to be able to do some analysis of the signals and satisfy the scientific part of my personality. I also would like to be able to monitor SIDs and it might be nice to keep a watch on the geomagnetic field as well.

Here are the results of my initial search for software and other tools to put together a home based Natural Radio monitoring system. It's pretty amazing to find that so much development has been done, a good portion by European enthusiasts.

Audacity – I have mentioned Audacity in past columns. This is a freeware, open-source, multi-platform recording and editing program. The latest version, 1.2.2 has finally added metering which, at least in my view, makes the software much more useable.

This program will let you extract important portions of your recordings and also allow processing to remove noise and enhance the signals.

Audacity is very easy to learn and will probably take care of all your editing needs for extracting the interesting pieces from your recordings. You can also write your own plug ins for the program using the Nyquist language. This program has versions that will run under Windows 98 or newer, Macintosh, and Linux. Download the program at http://audacity.sourceforge.net/

While searching out audio editors I came upon a freeware utility called QuickMix. This utility lets you develop presets for the Windows Sound Mixer so you can instantly set it up for your various software configurations. It is a real aggravation eliminator, since Windows often resets the mixer settings to its own preferences. The download and information are available at http://www.ptpart.co.uk/quickmix/.
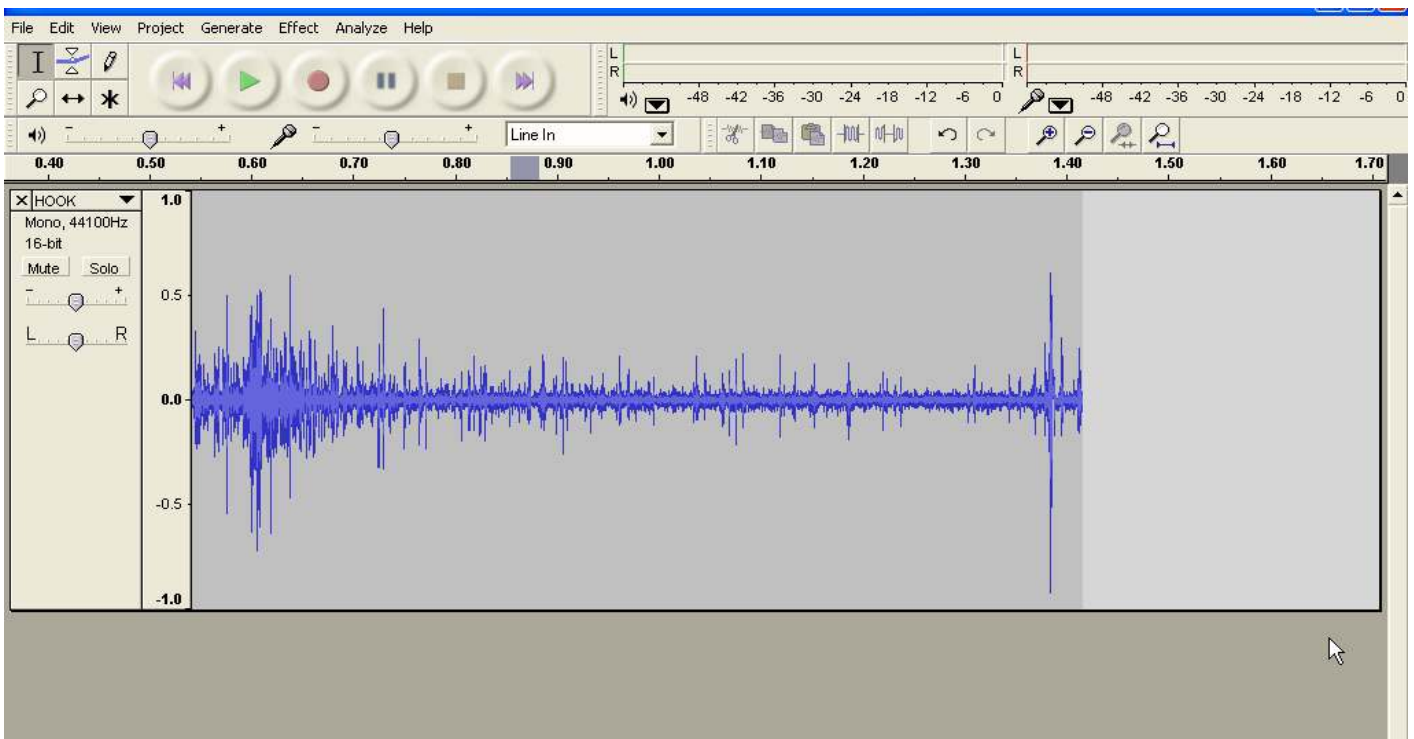
Figure 1 - Audacity Window with spheric.

Spectrum Lab –Wolfgang "Wolf" Büscher, DL4YHF's Spectrum Laboratory (SpecLab), is a program that lets you do spectrum analysis of an audio signal coming into your soundcard, analyze the spectrum of a previously recorded sound in a .wav file, observe how the spectrum changes over the time by a "waterfall" display and perform complex audio filtering in real-time, using also the soundcard's output. The program also has other applications to generate and decode some 'special' digital radio amateur communication modes if you are interested in that also.
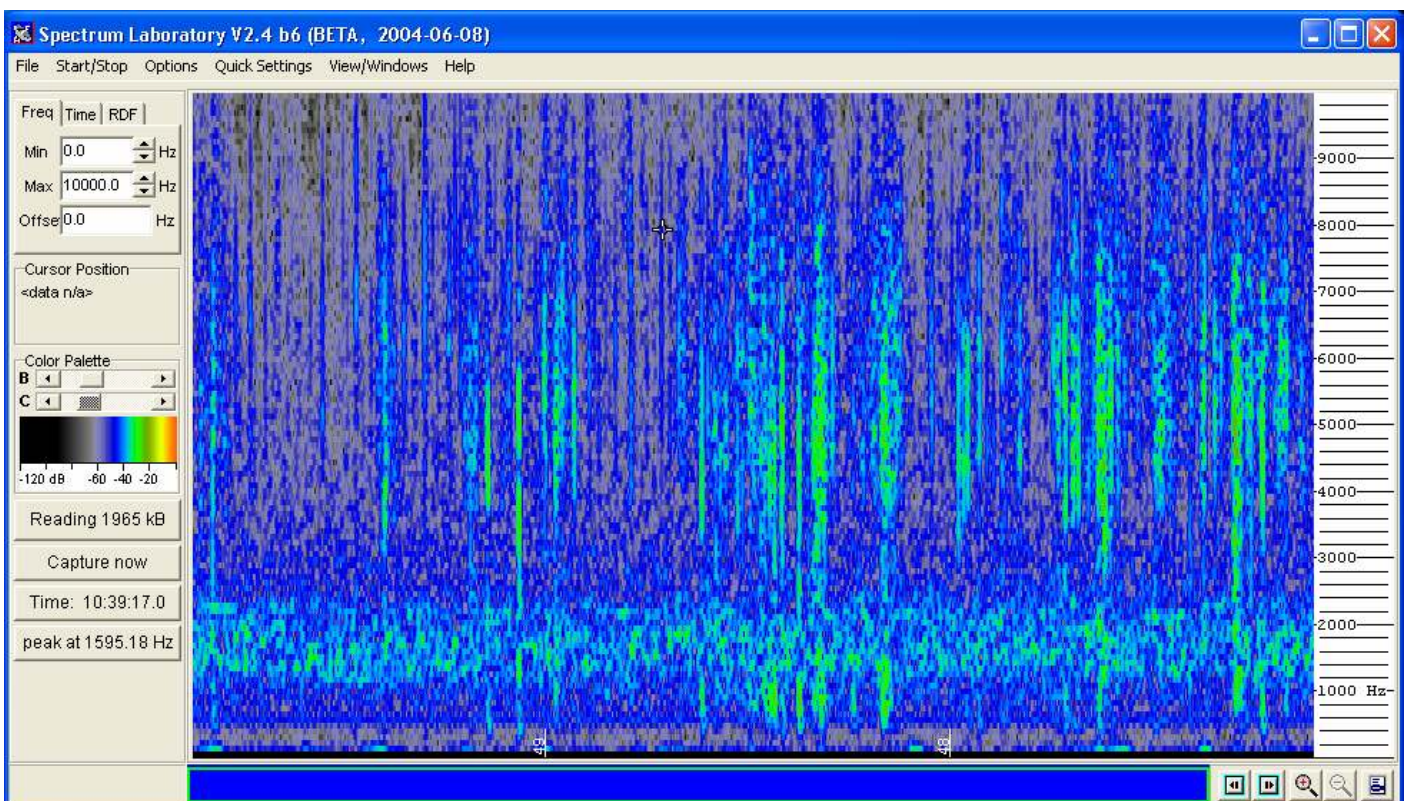

Figure 2 - Spectum Laboratory "waterfall" display.

As Wolf became interested in the reception of natural radio, some new functions were implemented in Spectrum Lab -- most importantly the removal of AC hum (including

harmonics) and other types of power-line noise. If you need it, you can add up to 32 other independent notches, and high-pass or low-pass filters to remove other unwanted signals, like 70 Hz from PC monitors.

This is a complex, well designed program with lots of functionality. The website has lots of application notes and if you search the archives of the VLF_group, you will find many discussion threads on this program.
Download it at http://www.qsl.net/dl4yhf/spectra1.html

Spectran -- Spectran by Alberto, I2PHD and Vittorio, IK2CZL is a free for non-commercial use, easy to use program that does real time or deferred spectral analysis. This program was originally designed for weak signal reception but has applications for Natural Radio use as well The program also has real time audio filtering (band pass, de-noising, band reject and CW peaking) of audio signals, using the PC sound card to digitize the input analog signal, or taking as input a WAV file.

The interface is simple and intuitive and I was able to use this program without reading the instructions. Download the program at http://www.qsl.net/padan/spectran.html
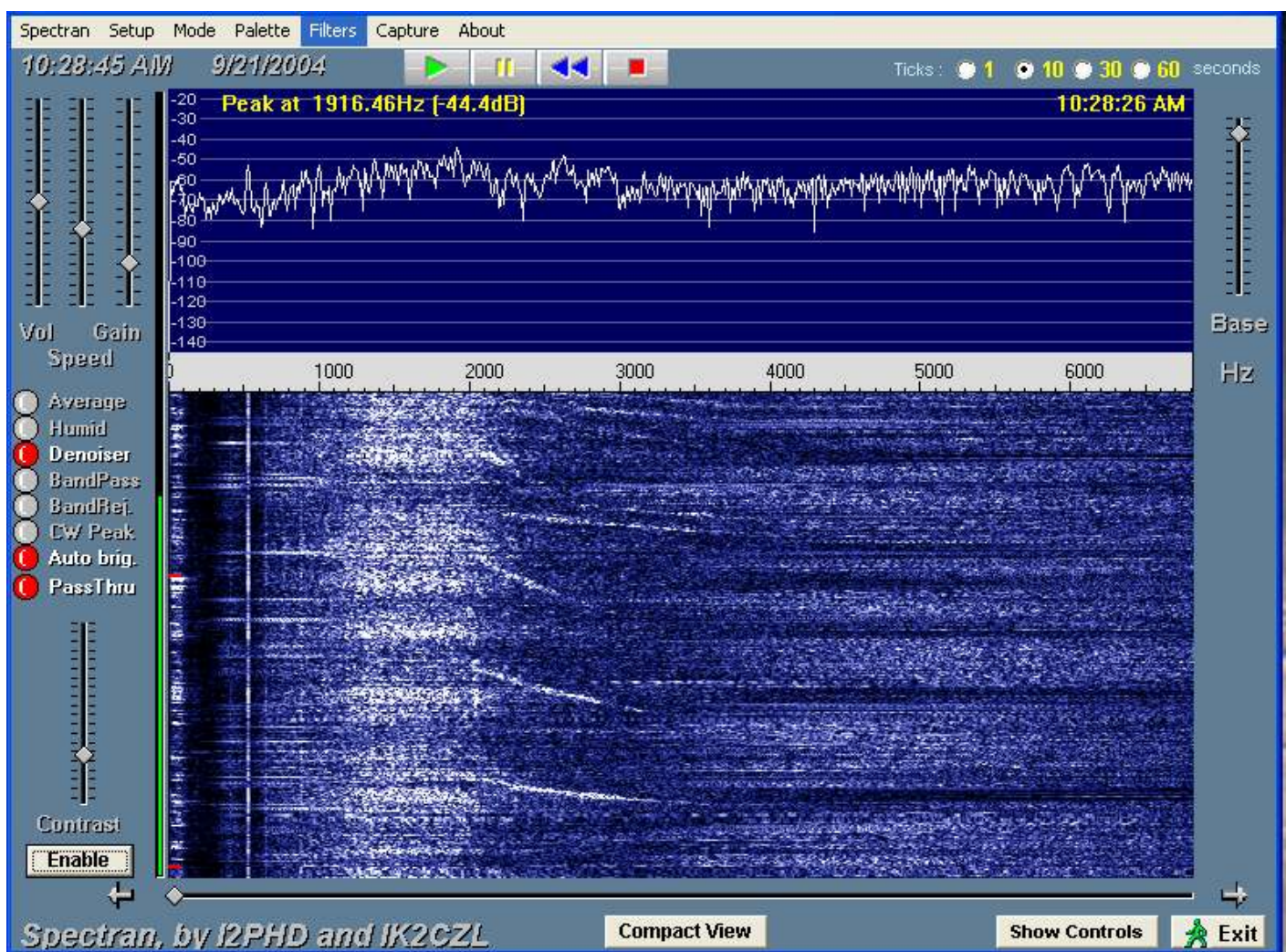

Figure 3 - Spectran main window display.

Spectrogram – Spectrogram version 11, by Richard Horne, is a shareware dual channel audio spectrum analyzer for Windows 95 and higher which can provide either a scrolling time-frequency display or a spectrum analyzer scope display in real time for any sound source connected to your sound card. Spectrogram allows unlimited recording and playback of the sounds from the audio spectrum display and can provide

very high resolution spectrum analysis of wave files with a wide choice of frequency bands and frequency resolution and either linear or logarithmic frequency scales. Spectrum data logging capability is also provided. Spectrogram is ideal for any purpose related to sound spectrum analysis including. The demo version is good fro 10 days and can be registered after that time for $45. Download it at:
http://www.visualizationsoftware.com/gram.html

Commercial SID Receiver -- This one sounds interesting, especially as it comes with software. Radio Astronomy Supplies is offering a new "VLF 40 KHz", Computer Controlled", radio telescope. It is advertised as a high quality, low cost, research grade, radio telescope . . . a "turn-key" system is for solar research. The VLF Receiver will display any solar enhancements reaching the D-Layer of the earth's atmosphere. The system comes with the Antenna, Software and Computer Interface Cable, Power Supply and Instruction Manual and is priced at $180.00. Visit their website at http://www.nitehawk.com/rasmit/ras.html

Build It Yourself SID Receiver -- Arthur Stokes Sr., N8BN of the American Association of Variable Star Observers (AAVSO) has designed a few popular gyrator based VLF receivers over the years. This latest version can be used to detect Sudden Ionospheric Disturbances by monitoring the signal level of a VLF station like NAA. The diagram and info is available at the AAVSO website, the circuit board is available from FAR circuits. http://www.aavso.org/observing/programs/solar/gyrator.shtml

Geomagnetic Monitor – Fat Quarter software makes a geomagnetic monitor kit that uses a fluxgate sensor. The kit sells for about $80 and could be used to provide early warning of geomagnetic fluctuations at your location. Information and application note, as well as ordering information is available at
http://www.fatquarterssoftware.com/Kits/Kit002.htm

Other Resources –
Notes on Domestic VLF Reception. Paul Nicholson in the UK, who has developed the excellent hum filters for both Spectrum Lab and Spectran, has done much research on techniques for receiving Natural Radio signals in a powerline noisy, suburban environment. His article describes the design process in detail and has information on using Spectrum lab to filter the signal. This is an excellent article for anyone wanting to build a home based setup. See the article at http://www.abelian.demon.co.uk/vlf/

Floating Solar Receiver. Renato Romero designed a floating solar powered receiver as a means to eliminate hum from his home receiving setup. A description, schematic and photos are on his website at http://www.vlf.it/FSR/FSR.html .

New Email Address -- Last week I was notified by my Internet service provider that I had the dubious honor of being one of the most spammed accounts on their server (up to 1000 pieces per day) and they strongly suggested that I close out a few of my Email addresses, (or they would do it for me). This occupied the better part of two days, sending out notices and so on. So please note the new address above, radio@norwest.net.