Natural Radio

News, Comments and Letters About Natural Radio

February 2003

Solar activity has declined to almost nothing the past couple of weeks, but since the downward part of the cycle is just beginning we are still in for some flare and CME activity in the upcoming months. I've been plotting power lines on my aeronautical map and probably need to do a road trip or two to fill in some of the gaps. Eventually I hope to come up with alternate nearby quiet sites – especially one that is accessible in the predawn hours. Now that the Holidays are over, there should be some time to do a little listening on these cold winter mornings. Sunrise is still late enough that you don't have to get up at a ridiculous hour to hear some whistlers.

After several months of low activity, the VLF_Group list has been quiet busy lately with talk about loop antennas, noise blanking systems and software receivers. Subscribe by sending a blank e-mail to (VLF_Group-subscribe@yahoogroups.com) from the e-mail account you wish to have subscribed to the VLF group.

More Recording Tools - When I need to record or edit a sound file I am fortunate to have a lot of tools at my disposal since I am in that business. But for those of you who have been trying to make do with Windows Sound Recorder, (which leaves much to be desired), here's a much better program.

In researching information for another publication I came across a simple but powerful audio editing program that would be ideal for recording and editing Natural Radio or other VLF signals. *Audacity* is freeware and is available from http://audacity.sourceforge.net/. The program is cross platform and versions are available for Windows, Macintosh and the Unix & Linux platforms.

Audacity will allow you to record wave files and edit them. With the appropriate encoder download you can even output them as .MP3 files for web distribution. The program is extremely easy to use and avoids all the unneeded complications that many of the other editing programs have. There's a great tutorial available and you should run through it to get familiar with the program.

One minor deficiency is that *Audacity* doesn't contain an audio level meter. For whatever reason, and one that totally defies any rational form of logic, Microsoft removed the meter from their recording control in the last few versions of Windows?!? Not to worry though, there is a wonderful little shareware VU meter at http://www.darkwood.demon.co.uk/PC/meter.html.

Just remember that when you are using the program, your recording level is set (at least on PCs) by the Windows Recording Volume Control. Double click on the loudspeaker icon at the lower right of your screen and the **Volume Control** panel will come up. Then click on **Options** in the upper left and select **Properties**. A new

window will open. Select **Recording** from the "**adjust volume for**" list and then select your recording source, and then click on **OK**. The **Recording Control** will then appear and you can use that to set the recording level while watching the meter.

You can click and drag to highlight an area that you want to edit, and then cut and paste. There is some limited filtering available, as well as simple spectrum analysis. There are two versions of the program on the website. Version 1.0.0 is the bugfree, stable version of the program. Version 1.1.2 is the latest Beta version of the program that has more features, but is still under development.

For All You Receiver Designers - There is a new article on Renato Romero's website, http://www.vlf.it/, titled *What and Where is the Natural Noise Floor*? by John Meloy, AJ6LS. John takes data from several studies of atmospheric noise in the ELF & VLF frequency ranges and plots some interesting graphs showing the natural noise level under various conditions. It should help designers to decide just how quiet receivers really need to be.

VLF Sounds From Space - Shawn Korgan advised us that Prof. Donald A Gurnett uploaded some samples from his 30 year collection of space sounds to the University of Iowa site at http://www-pw.physics.uiowa.edu/space-audio/index.html.

There are some very interesting Natural Radio Sounds here along with graphics and an explanation of how the sounds originate. Some are sounds that are familiar to all of us and others are "out of this world" because they occur above the ionosphere and can only be recorded by satellite. There are also some satellite recorded signals from other planets.

If you explore the site further, you will learn about a production called *Sun Rings*, which is multi-sensory musical experience performed by *Kronos* and inspired by Prof. Gurnett's space sounds.

"The multimedia production *Sun Rings* is based on sounds of space collected by University of Iowa Prof. Don Gurnett over a 40-year period. The musical portion of *Sun Rings* was composed by Terry Riley, performed by the Kronos Quartet with choral performances by University of Iowa School of Music choirs; the visual production was created by visual designer Willie Williams."

Your Much Appreciated Correspondence

• **Jim Ericson (jim@acmetesting.com)** I agree entirely with Mark's summary (in the January 2003 issue) of various recording options for capturing Natural Radio Signals. My background, like Mark's, includes some 30 years of studio (and broadcast) recording ... and even some early fiddling with 1950's-vintage wire recorders.

I ran a LowFER beacon in Sunnyvale, California during the 90's, and did considerable field listening for LowFERS and Whistlers. My first recorder for recording field sessions was a Marantz PMD-430 (analog stereo cassette). A fine machine for $500,

but it still had the inherent limitations of analog (i.e., only fair signal-to-noise ratio and dynamic range).

In 1993 I saved up my money and graduated to a Sony DAT machine (a Walkman-sized Sony D-7). It cost me about $600 at the time, but what a recorder! All of a sudden I had 90+ dB S/N ratio, a dynamic range of more than 90 dB, and frequency response that was better than +/- 1 dB from 20 Hz to 20 kHz! And, the bonus of 120 minutes of recording time in the "best" quality mode! Machine reliability has been superb, in spite of lots of field excursions and cigarette smoking nearby. The D-7 has logged over 2500 hours of recording time with no maintenance (other than periodically running the Sony head cleaning tape). This D-7 model is no longer available, having been replaced by the similar D-8 model (same form factor, but with both analog *and* digital input/output capability). The current price for the D-8 version is also somewhere around $600. These D-8's are mainly used by National Public Radio field reporters, and the like. And, of course, a few crazed experimenters like us.

DAT is the only way to go in my opinion. The Minidisc format is cute, but it uses a compression algorithm -- great for affluent teenagers, but no good for serious work. Cassette quality doesn't make it at all. An old Ampex 15 ips. reel-to-reel would be fairly good for LowFER and Whistler work, but I can't lift anything that heavy any longer. And the 20 mile long extension cord ...?

Working with the DAT requires some understanding of dynamic range ... and some practice with capturing intermittently loud signals (like Whistlers) without distortion. Unlike analog recording where you need to keep the levels "bumping the red", with digital recording you can never EVER exceed 0 dB, or horrible digital distortion will result. Fortunately with over 90 dB of dynamic range to play with, you can set your nominal DAT record levels quite low in order to give plenty of headroom for that loud whistler that you're hunting for. And, don't even CONSIDER using the optional "speech" or "music" record mode on the Sony. Both of these are ALC. Always record in "manual" mode, and use the Line Input rather than the Microphone Input (the technical specs are better on Line Input).

Maintenance for DAT recorders is nil, except for keeping a good logbook on the machine to remind you to run the head cleaning tape every 40 hours or so. These things are really miniature video recorders, so dust and sand are pure murder on the tiny moving parts and the rapidly spinning record head. Treat the DAT machine with a little respect, and it should give good service. If problems DO develop, I am told that Pro Digital Inc. in Pennsylvania [(610)-353-2400] offers very professional DAT service (and sales).

By the way, I download my DAT recordings to my PC, and for editing I use CoolEdit (a great audio editing application).

Although I'm not presently active in the hobby, I always follow the "happenings" in the LOWDOWN. Perhaps someday when things settle down at the EMC Lab, I'll have some extra time .....?