

Natural Radio

News, Comments and Letters About Natural Radio

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This Month The second part of Jim Stoughton's article *A Poor Man's Pen Chart Recorder* appears in this issue. This is a great construction article for those of you who monitor ELF and seismic events. I apologize for the delay in this article but had difficulty scanning the pictures. A new HP scanner/printer seems to have remedied that problem and is making my life a bit easier.

Again, many thanks to all of you who send in E-mail and correspondence. Bill Hooper tipped me off to the IMAGE satellite data this month. Other bits of information, your correspondence and articles help me get this column together and keep *The Lowdown* an interesting and useful publication.

Also please note the corrected dates for the Spring Equinox coordinated monitoring below.

Image Sees Earth's Invisible Magnetosphere The IMAGE satellite, launched on March 25 of last year is sending back images and data of the Earth's magnetosphere. See the website (<http://image.gsfc.nasa.gov/>) for pictures and more information. The satellite is in an elliptical orbit with an apogee of 7 earth radii approximately over the North Pole. The new imaging technology offers never-before-seen views of the transparent, electrified gas trapped in the Earth's magnetic field. For us Natural Radio enthusiasts, it provides the first visual, global perspectives on magnetic storms.

These new images confirmed the presence of the suspected "tail" of electrified gas that streams from the earth to the sun. The solar wind buffets the magnetosphere and compresses it on the sun facing side of the earth. On the night side of the earth the magnetosphere stretches out like the tail of a raindrop past the moon's orbit. Near the boundaries of the magnetosphere, plasma is dragged along with the solar wind. Some of it changes direction and flows back through the magnetosphere towards the Sun, moving around the earth in tail-like flows. This return flow is believed to be the energy source for auroras. During a magnetic storm the stretched out magnetosphere can snap back suddenly and fling plasma violently back at the earth. The plasma, heated to several million degrees, whirls around the Earth generating multi-million-amp currents.

This confirms the theories, but several interesting things were discovered. The images revealed nearly empty areas in the plasma cloud. The IMAGE scientists have referred to these as "troughs" and are studying the data to find a theory of formation. IMAGE also discovered that hot plasma formed during geomagnetic storms is occasionally more dense on the day side of the earth. This also was unexpected and is being studied.

For a real-time look at what's going on in the magnetosphere, try this site. (<http://www.sec.noaa.gov/IMAGE/>) The site displays the latest Far Ultraviolet image from the satellite, as well as animation of pictures from the previous few hours. Be aware that when the satellite is at perigee, no data is available for a few hours when the satellite is under the earth and out of range. The orbital period of the satellite is around 14 hours. The website also has links to orbital data so you can find out where the satellite is at any given time.

The satellite also has a low frequency (3 kHz to 3 MHz) radar device to do plasma density measurements. Some studies of whistler mode propagation have also have been done with this instrument.

This page of the site, (<http://image.gsfc.nasa.gov/poetry/>) shows the progress of last July's geomagnetic storm.

Bargain Basement Magnetometer In browsing the IMAGE website, I came across a page labeled "magnetometer" and it caught my interest -- (<http://image.gsfc.nasa.gov/poetry/workbook/magnet.html>). This is a project suitable for Middle or High School students and allows you to build a magnetometer that will detect geomagnetic storms for less than five dollars. This might be a fun project, and I suggest you check out the site.

For those of you without web access, the magnetometer consists of a small bar magnet with a mirror of approximately ½" diameter glued to its side. A piece of soda straw is glued to the top of the magnet and a thread is passed through the straw. The ends of the thread are tied together with a little bit of slack, forming a loop. The loop turns into a triangle when held in the middle, with the bar magnet and its mirror suspended horizontally. Pass a longer thread through this loop and tie it around the first thread and now you have a bar magnet suspended horizontally with a mirror facing sideways.

Cut the top off of a large, clear soda bottle from which the label has been removed. Put a couple of inches of dry sand or other heavy material in the bottom of the bottle. Suspend your magnet/mirror assembly from the cap, replace the top of the bottle and tape it back on to the bottom. A large wide-mouth glass jar will work just as well and you won't have to cut the top off to get the magnet assembly in.

The hanging magnet should align itself with the earth's magnetic field, and the bottle will protect it from air currents. If you shine the light from a clear bulb, or laser pointer at the mirror, you should be able to project a spot on the wall. Deflection of the spot will indicate shifts in the earth's magnetic field. This device is sensitive enough to detect a passing automobile at about fifty feet away.

Coordinated Listening for Spring Equinox Here we go again with the Spring Equinox coordinated listening. As single digit temperatures continue here in Illinois, it's hard to believe spring is on the way. The *correct* dates are the weekends of March 17 - 18 and March 24 - 25. Thanks to Shawn Korgan for pointing out my error in the dates published in last months *Lowdown*. (Where *are* those reading glasses?)

The sun has been quiet for the past several months even though this current solar sunspot cycle has reached its peak. Scientists have confirmed that the Sun's poles are flipping their polarity, which is a sure sign that we have passed the peak of the cycle. Let's hope that it has been saving its activity for the Spring Equinox.

Again, here are the monitoring and logging procedures.

As a minimum, please monitor and record, if possible, the first six minutes of the hour beginning at 6:00 AM local time. This should be very close to local sunrise. You are encouraged to monitor up to three hours before and two hours after local sunrise. Please note as I mentioned last month, that the critical listening time for these weekends is 1100 hours UTC. This is near sunrise on the East Coast, and will give us the best chance of coordinating results across the US.

If you are recording, begin each segment with an announcement of your name, date and location. Follow the announcement with a recording of WWV or CHU with their top-of-the-hour time announcement and marker tone. Then without stopping the recorder, transfer the recorder input to your VLF receiver and let it run through the start of minute 6. If you have a DAT, mini-disk, or stereo cassette recorder, its OK to record the time signals on the alternate channel -- but test the setup for crosstalk first.

If you are not recording, it is important to keep an accurate log. The data will be most useful if it is timed accurately. Use WWV time signals and a stopwatch. Prepare a sheet of lined notebook paper with time and date indicated at the top. Allow 3 or 4 lines for each of the six minutes and mark them from 0 - 5 in the left margin. Start your stopwatch on the hour mark from WWV. Starting at the beginning of the "0" line record the second at which each event happens followed with an abbreviated description of the event. For example, write "W" for whistler, "T" for tweek, and qualifiers such as big, hissy, long, many, etc. Continue down the line, but remember to move to the next section when minute "1" comes up. Leave space on the right for to indicate chorus, hiss, or any other signals that continue throughout the session. Don't try to log every sferic unless you can write very fast and very small.

If you've recorded, please log your tapes in the manner indicated above.

Send in a copy of your log (please don't send originals). If I receive enough logs to establish some coordination between them, I'll publish a composite report in a future issue of *The Lowdown*. If there doesn't seem to be any coordinated activity, or if the ionosphere doesn't cooperate, I'll publish the highlights of individual results.

New Web Links Renato Romero, IK1QFK, has added a VLF Link Board to his site. (<http://www.vlf.it/>) there are many links here that should be of interest to Natural Radio listeners.

ELF Event Precedes India Quake Wolfgang Schippke, DC3MF, has a site with lots of useful Natural Radio information. (<http://schippke.tripod.com/ELF/Index.htm>). The site describes his observation of an ELF event that swept downward from 14 Hz to 1 Hz over a period of 18 minutes. This event preceded the India earthquake. Those of

you who do ELF listening might find it interesting. He would appreciate hearing from anyone who made similar observations or might be able to shed some light on the signals he observed..

Your Much Appreciated Correspondence

• **Dave Ewer (vlfun1@aol.com)** I just began my subscription to *The Lowdown* with the January issue. I would appreciate it a lot if you'd mention some reader response to Mr. Fusare's excellent whistler receiver design article published in the February issue. I've performed dozens of experiments using his circuit ideas over the last week and find them very sound. I'm in the process of building a new receiver utilizing the front-end design portrayed in that article and have to say that the input impedance improvement is tremendous. Mr. Fusare's grasp of electronics design and mathematics is most impressive and I look forward to seeing anything else he and others contribute. Thanks to all of you as well for a great publication and forum.

• **Michael Mideke, WB6EER, Benson, AZ** Time for a small update. Yesterday afternoon (25 Jan.), I was testing a new receiver at my Soza Mesa "overlook" site. Two channel, 56 ft crossed loops. From when I got set up, around 1930 UT, I heard low pitched "yooping" or "hooky" emissions, kind of scattered, two or three events then a couple of minutes of silence. Never very strong, they got progressively weaker over the next couple hours. At about 2126 there was one strong diffuse whistler, 2-hop from an intense sferic cluster. Today I was up there around the same time, checking on my de-bugging (no luck there). Conditions were very quiet, aside from the pervasive powerline hum, just scattered sferics ranging from weak to moderately strong and not a hint of whistlers or emissions.

Haven't checked the live VLF website yet - Maybe this weekend. Probably back up to New Mexico next week, hopefully with the new receiver ready for serious field testing.