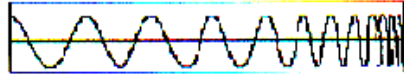


# TAOSON



SIGNAL.

TAOSON Signal Issue No. 7 March, 2009

TAOSON Director-- David Fields N4HBO  
Newsletter Editor --Bill Seymour KM4YL

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## I. Welcome

Welcome to the **Tamke-Allan Observatory Solar Observation Network**. **TAOSON** was conceived in 2007 and operated for its first year as a student group at TAO with members Tyler Moore, Heather Fries and David Fields. In 2008 we opened up the group to the larger local amateur radio astronomy community.

The primary purpose of TAOSON is to keep local radio astronomers in touch and help coordinate their activities as they maintain their radio astronomy research sites. To this end we maintain a server for storing and sharing data, schedule meetings each month, and assist each other when needed. Most members support the Society of Amateur Radio Astronomers (see [www.radio-astronomy.org](http://www.radio-astronomy.org)).

TAOSON participates in the TAO Academic Associates of colleges and universities where members share research and scientific goals. This is both science and a humanistic endeavor that encourages cultural exchange. TAOSON also helps advise the TAO students and our Space Explorer Groups with a common goal of developing capable and motivated human beings that will serve the community and become future scientists and contributors to a better world.

Membership is free if you're actively doing radio astronomy and if you'll contribute to keeping colleagues informed of your radio astronomy adventures.

## II. Meetings

### TAOSON

**Next Meeting: April 9 in Chattanooga for some conversation and dinner, then a radio astronomy lecture (see Upcoming Events, below). Chattanooga people will decide the best venue for the dinner meeting, and we'll let everyone know by email on Wednesday.**

TAOSON met at TAO on March 15. We shared information about activities and projects. David Fields gave a program that covered Maxwell's equations through a discussion of EM signal generation, polarization, and practical considerations of receiving and interpreting polarized signals.

Meeting format will usually include a brief tutorial on a radio astronomy topic of interest, a work session on some chosen task or topic, a meal or refreshments, and a brainstorming session about projects.

### Area Optical Astronomy Groups

Oak Ridge Isochronous Observation Network (Orion) meets at 7:00 P.M. on the first Wednesday of each month The Club Room, Oak Ridge Civic Center. See [www.roanestate.edu/obs](http://www.roanestate.edu/obs) and [www.orioninc.org](http://www.orioninc.org)

Barnard Astronomical Society (BAS) meets at 7:00 P.M. on the second Thursday of each month at the UT Chattanooga Clarence Jones Observatory. See [BAS@chattanooga.net](mailto:BAS@chattanooga.net).

### Upcoming Events

Chuck Higgins is one of the original Univ. of Florida contributors to the NASA Project Jove team, and has done a lot of research on Jupiter radio emissions. He will speak in Chattanooga on Thursday April 9. Chuck gave a presentation at TAO five years ago and it was a pleasure to meet him in person and hear his perspective. Here's the skinny on his presentation.

Barnard Astronomical Society Meeting, Chattanooga, April 9, 2009

Location: [UTC's Clarence T. Jones Observatory](#) on Brainerd Road in Chattanooga, Tennessee.  
Social half-hour at 7:00 pm. Presentation at 7:30 pm. ([map to observatory](#)).

Speaker: Dr. Chuck Higgins, Professor of Physics & Astronomy at MTSU  
Topic: "Jupiter and Her Satellites: Radio Connections"

### Abstract

Until the Galileo spacecraft mission to Jupiter, the low frequency radio emission from Jupiter's magnetosphere was known to be influenced by the satellite Io. In 1998 it was found that Ganymede and Callisto have small influences on the radio emission in the 2.0–5.6 MHz range (Menietti et al., 1998,2001). Subsequently Higgins et al. (2006, 2007) found that Europa's phase shows a minor but statistically significant effect on the lower range of decametric radio emissions. Therefore, all four Galilean moons show an influence on Jupiter's radio emission. Results from data analysis of Voyager and Galileo spacecraft data are explained.

Also included will be an overview of The Radio JOVE project(<http://radiojove.gsfc.nasa.gov>): a NASA education and outreach project intended for students, teachers, and the general public to learn the basics of radio astronomy. With this radio telescope they can receive signals from the galaxy, the Sun, Jupiter, and of course a variety of manmade and terrestrial radio noise sources.

ORION meets the first Wednesday in Oak Ridge.  
BAS meets the second Thursday in Chattanooga.

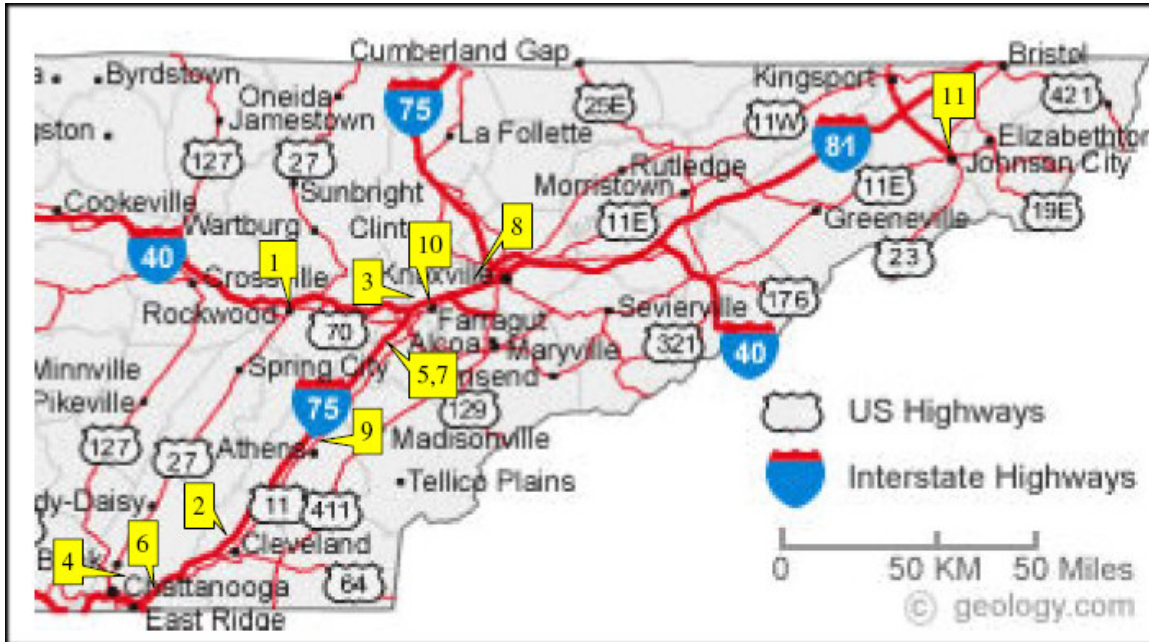
## **III. The TAOSON Signal**

Our newsletter, the TAOSON Signal, will be published on a periodic basis as sufficient articles and other written contributions are received. Every effort will be made to protect the e-mail addresses on the distribution list and the privacy of their owners. Feel free to circulate and share copies of the Signal.

Items for the newsletter will be submitted by e-mail to Editor Bill Seymour at [swafseymo@bellsouth.net](mailto:swafseymo@bellsouth.net) and to David Fields at [fieldsde@aol.com](mailto:fieldsde@aol.com). We encourage each active member to submit at least a paragraph that summarizes site activities, goals, and ideas. Members are also invited to submit questions to the Editor to be considered in the newsletter and at meeting

## IV. Research Site Locations and Capabilities

TAOSON sites include those shown on the following map and identified in the following table



Site Location	Name	Code	Control Operator	Lat Long	Telephone	Operations
1 Rockwood	TAO	TAO	David Fields	35.8322 84.6175	865-376-1362	21 cm, 15m, optical, Ku, Spectracyber, Interferometer, IBT
2 Cleveland	Niota	SN	Bill & Melinda Lord	35.2427 84.8783	423-478-9043	21 cm, 15m, optical, Ku, Spectracyber, VLF (SID), FM Meteor, IBT
3 Solway	Solway	SOL	David Fields	35.9641 84.2021	865-927-5155	15m, Ku (2), optical, VLF, H-alpha
4 Hixson	Riverbend	RB	Dick Castle		423-870-4398	15m
5/7 Lenoir City	Lenoir City	LC	Aaron Haun		865-986-7153	Server, 15 m
6 Signal Mtn.	Mountain	MTN	Bill Seymour		423-870-8552	15m, optical, Ku, VLF (SID), IBT
8 Blue Meadow	Blue Meadow	BLM	Linda Fippin		865-539-0826	VLF
9 Niota	Niota	CL	John Mannone		423-337-2197	Ku, Optical, VLF, IBT
10 Karns	Karns	KA	Carl Lyster			Spectracyber, VLF
11 Johnson City	Johnson City	JC	Heather Fries			Quantitative optical, VLF (SID) planned
Puerto Rico	Puerto Rico	PR	Wanda Diaz			15 m, Spectracyber
UNAM, MX	Mexico	UN	Stan Kurtz			15m, Spectracyber, Homebrew IBT, SRT

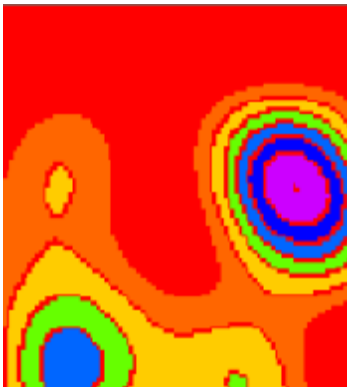
## V. Basic Research Activities at Tamke-Allan Observatory

See [www.roanestate.edu/obs](http://www.roanestate.edu/obs) . Free Public Skygazes are conducted on the 1<sup>st</sup> and 3<sup>rd</sup> Saturday evenings of each months and TAOSON members are invited. TAOSON meetings are held as the need arises.

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TAO is our primary meeting and workshop site. Capabilities include SpectraCyber, Jove system, IBT, Ku interferometer, and meteor bounce, plus optical equipment that includes an 8” refractor, 12” reflector scopes, Sky Scout, and spectrometers. SpectraCyber was built by Carl Lyster and used by Heather Fries last year for mapping.

The Ku band interferometer has also been used recently for mapping – this plot (below left) shows the Ku emission from the sun and a near Clarke Belt satellite. Meteors are enjoyed by trying to detect the reflection of FM radio signals from their ionized tails. The photo (below right) shows the beautiful night sky during the Perseid shower at 4 AM on August 12.



## VI. TAOSON Projects

### Radio Jove

**Dick Castle, Jove Coordinator, K2IMH**

Welcome to the Radio Jove portion of the newsletter. Radio Jove is a NASA sponsored project to monitor the Sun and Jupiter at 20.1 MHz. It is teaching tool for radio astronomy for middle /high school, college students, amateurs and research groups. You build your own receiver and dual dipole antenna. Radio Jove web site is: [radiojove.gsfc.nasa.gov](http://radiojove.gsfc.nasa.gov).

The TAOSON group presently has 3 systems on-line with another being built. Sites are:

1. Harriman, TN - Tamke Allen Observatory- David Fields
2. Cleveland, TN - Skynet -Bill and Melinda Lord
3. Chattanooga, TN- Riverbend- Dick Castle
4. Signal Mountain, TN –Signal Mountain; Being built; expected to be operational in 2009 - Bill Seymour

Our objective is to monitor the Sun/Jupiter and see how the ionosphere affects the signals in different locations in close proximity. Data will be collected via Skypipe and sent to a server to be stored for analyses. TAO and Riverbend sites have been on-line since 2004. The Skynet Jove receiver has been recently built at Bill and Melinda Lord's with very high professional standards. Starting back in the fall last year they built a separate radio astronomy building next to their roll-off roof optical building. A dual dipole antenna was constructed and installed permanently. After that the Jove receiver was built and Skypipe software was installed on the computer. At this point we were ready to start collecting data. Early this spring we built Ten Tec 1056 receiver and then modified it for 20.1 MHz. We calibrated all three site receivers to Kelvin units on Skypipe using the Jove calibrator. A calibration procedure was also written. We have participated in four Radio Jove tele-conferences. These phone teleconferences bring together people from all over the world to discuss Sun/Jupiter events in real time. Presently we are in the process of building a portable dual dipole antenna system using fiberglass poles. The antenna system can be set up in less than 15 minutes and then be stored in a military bag for ease of carrying to outdoor events. As you can see we have been very busy and accomplished quite a lot in short span of time. We still have a lot to do and have only hit the tip of the iceberg. Next month I'll publish a list of outstanding projects we plan to accomplish in the next few months.

### Itty Bitty Telescope (IBT)

**Tom Crowley**

[Several TAOSON members are members of the Society of Amateur Radio Astronomers (SARA) and take part in the SARA Navigator Project. Through this project, TAOSON has borrowed SARA IBTs, Ku band radio telescopes. Tom Crowley, SARA President and Navigator Coordinator, has agreed to be TAOSON project coordinator for our IBTs.]

SARA is developing a **new** Itty Bitty Radio Telescope (IBT) for the International Year of Astronomy (IYA) 2009. Initial tests have shown the new instrument is capable of a 90% meter deflection when looking at the Moon with an 18-inch dish. Now that's radio astronomy! We are planning on developing two versions, one will be able to do a level of real science and the other will cost much less and make a great intro or demo telescope.

So just what is an IBT, you ask? It consists of a direct TV satellite dish and LNB, with the advent of High definition satellite broadcast many of these small dishes are being discarded. You or your neighbor may have a dish that's ready to be tossed, and may well do the "green" thing and recycle it to an IBT. You simply add a satellite detector from Ebay or Radio Shack or order a Channel Master 1040IFD tuning meter for under \$80 on the web, build a base and you are ready to go.

If you are interested in building your own IBT check out:  
<http://www.aoc.nrao.edu/epo/teachers/ittybitty/procedure.html>

Many SARA members have built IBT's and have had good success with them. SARA editor John Mannone has used an IBT to determine speed and Doppler shift of an automobile. All right -- not quite radio astronomy, but a unique experiment nonetheless.

For more information on the International Year of Astronomy check out:  
<http://astronomy2009.us>

## **VII.Reports from The Sites**

### **TAO Site Report**

**David Fields, N4HBO**

#### **Predicting occurrence of VLF Whistler Signals – a proposed experiment**

Most of us have heard VLF whistler signals from radiation traveling along the earth's magnetic field. It will be interesting to determine where these signals originate and to predict when to listen. It would be an interesting experiment to calculate signal generation region and see if this calculation gives valid results. This experiment is not something that I plan to do immediately, but maybe some of the rest of you would like to validate the ability to predict occurrence of whistlers. If anyone wants to try this, then let me know and we can talk about some other things to listen for.

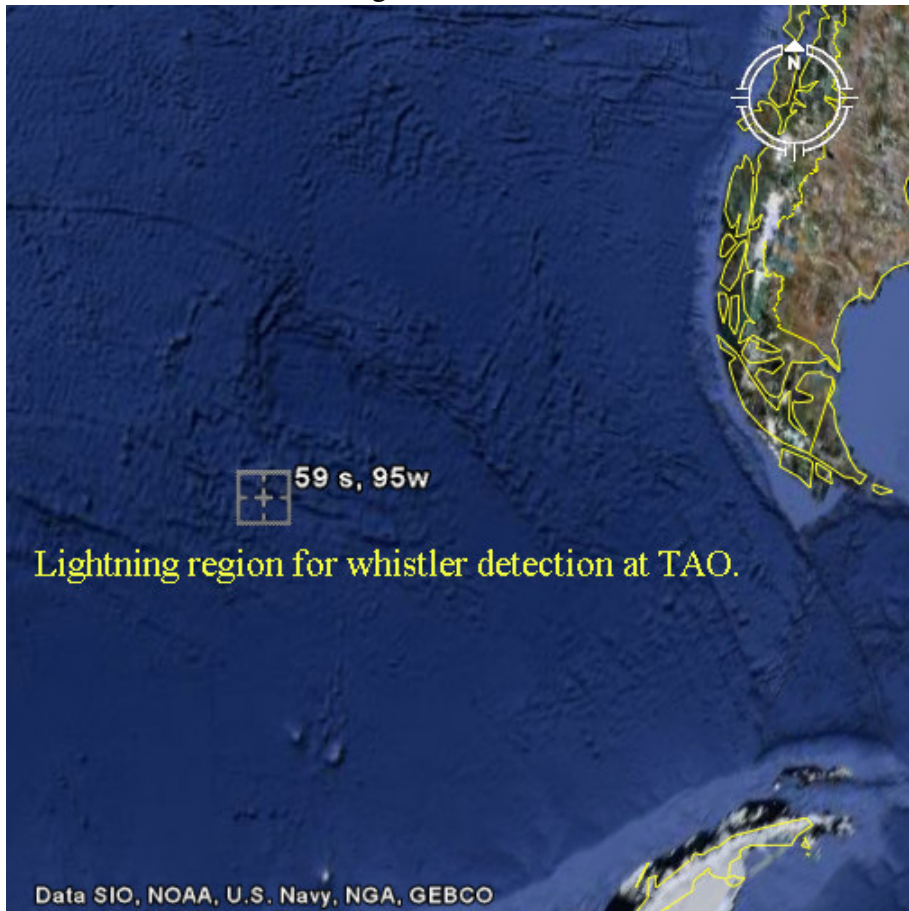
#### **Background for this experiment:**

The idea to be tested is that the point 59 degrees south latitude, 95 degrees west longitude is the region in which lightning generates whistler signals that are detected at TAO. This region should also generate signals heard at other E. Tn. TAOSON sites.

#### **Procedure:**



First, monitor the weather in this region of the world.



Second, plot the whistlers detected through time, ensuring that the period considered includes several tropical storms.

**Analysis:**

Third, determine if whistler detection frequencies heard in East TN under nice clear skies (for this lightning region) are indeed higher than whistler detection frequencies heard under tropical storm conditions.

**Generalization to other sites – determination of magnetic conjugate position:**

For those of you living outside E. TN, you'll need to determine the source point (lightning region) that will generate your signals. To do this, determine your magnetic conjugate region. A first approximation is to use your longitude and the negative of your latitude.

A more accurate approach consists of consulting plots of magnetic field direction and strength and locating the flux tube that connects your site, across the equator, to a ground region in the other hemisphere. This ground position is the one near which lightning is likely to generate whistlers.

A computational approach to determining the lightning region for your whistler monitoring position is to use numerical models of the geomagnetic field. This is accurate but you can lose track of the process. One recipe that you might use: link to <http://modelweb.gsfc.nasa.gov/models/cgm/cgm.html>, choose query form 1, then enter 2009 and your lat/lon. Let the program calculate your magnetic conjugate position (lightning site).

It may be interesting to explore the graphical input feature of this site – i.e. query form 2. Results are sometimes surprising but there is no graphical output utility. If you try this approach, be sure to use the proper data year!

**Solway Site Report:**

**David Fields, N4HBO**

**Control Room Challenges**

On March 19, the Solway site suffered a loss as wind pushed down an old tree. It was in the woods and was over 10 m from any equipment. Still, it had a long reach. It found the radio astronomy observatory/control room, the Pequod!

The left photo shows Moby Dish and the Pequod in happier times, during adjustments.



The right photo shows an interior view of the Peaquod interior, without the equipment, before it was touched by the tree:

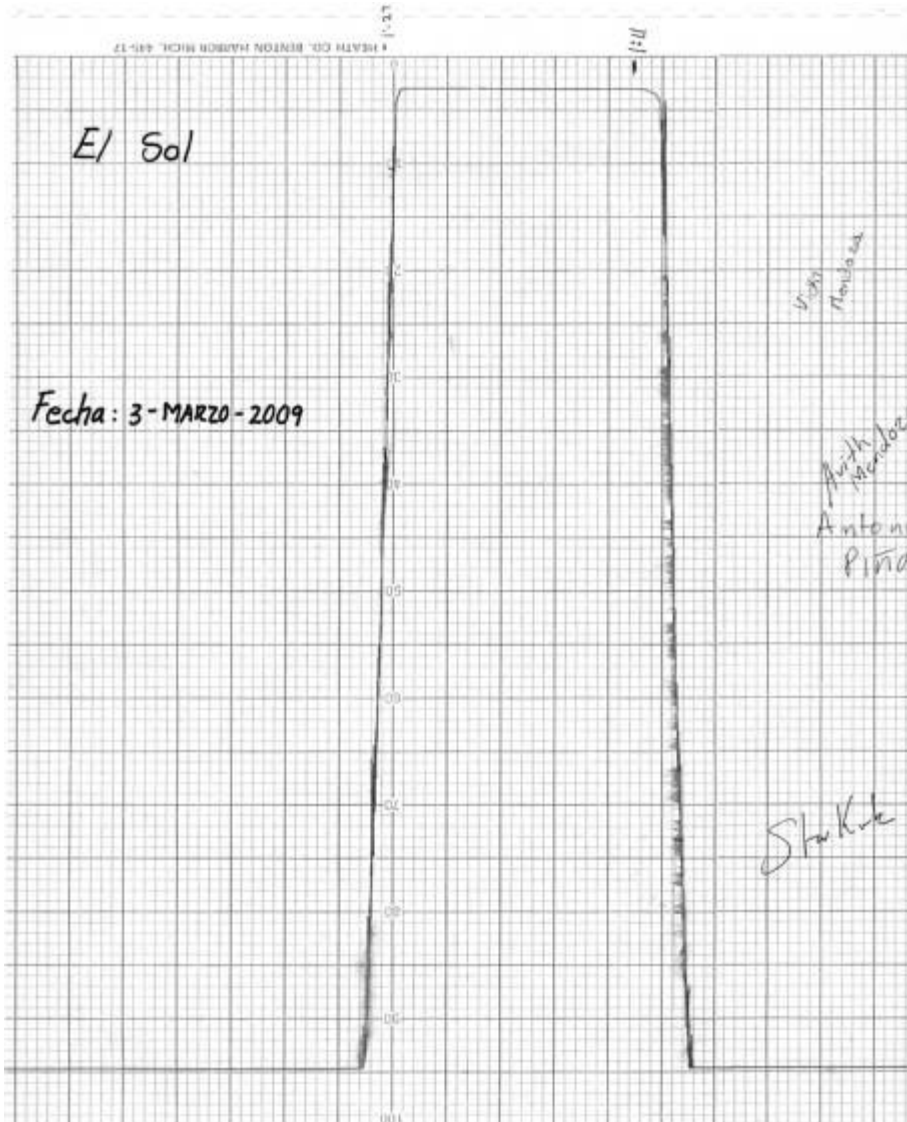
I have been getting the system ready for measurements on circular polarization at 15m wavelength solar radiation, to present at the 2009 SARA meeting. But no more. Now after the tree, the Peaquod is almost impossible to enter. The interior is trashed and window glass litters the area. Walls are bowed.



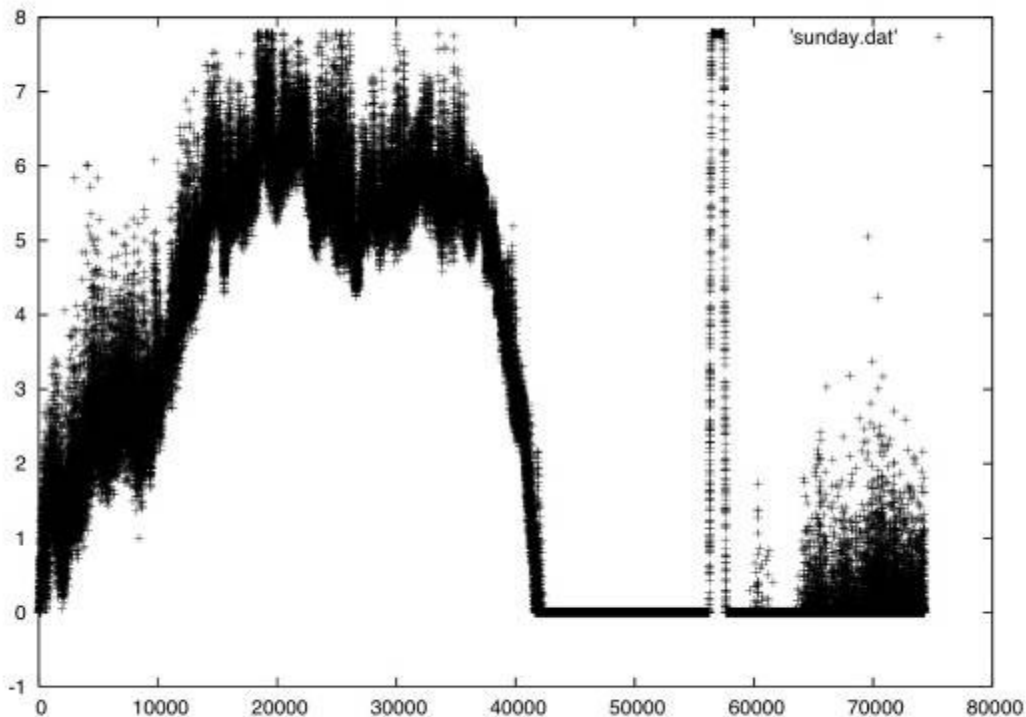
The final photo shows what is left of the tree.

Moby and the Peaquod were going to be used in 15 meter wavelength circular polarization studies to be discussed at SARA 2009. Now what? I have some thoughts, but am still doing research to see if the ideas might actually be worth pursuing.

Most of our progress this month has been on the 1.5 meter dish with LNB working at 3.9 GHz. We detected the Sun quite easily – saturating the detector, in fact (see Figure 1).



The next graph shows voltage (volts) versus time (seconds). We suspect that all the activity from about 0 to 40,000 seconds is the galactic plane. The 'spike' at about 58,000 seconds is the Sun. The data were taken with a National Instruments data acquisition system, using LabView. The data were then passed to a linux box and graphed with gnuplot.



One of the problems we've encountered is that the satellite finder we're using as a detector isn't stable from one day to the next (or sometimes even over night, during a 6 to 8 hour session). Overall, its sensitivity seems to be dropping, as we've had to steadily increase the gain over the course of a weeks' observing. The detector is indoors, and the temperature drift shouldn't be more than 5 or 6 degrees F. We're working on a detector circuit with a tunnel diode and an op amp. Hopefully that will be ready soon - and be more stable.

We were not able to detect the Moon at 3.8 GHz. It isn't clear yet if this is because we weren't pointed well enough or because we don't have enough sensitivity. We are guessing the latter. Beam dilution could be a problem (the Moon, at 0.5 degrees diameter, occupies a small fraction of the beam, which should be about 3.6 degrees in diameter). In hopes of improving this, we switched to a Ku-band LNB, for which (at 11.95 GHz) the beam should be about one third the size of the 3.8 GHz beam, (because  $3.8/11.95=0.32$ ), thus reducing the beam dilution. One problem, of course, is that this will require even better pointing than before, because now we'll need to locate the 0.5 degree Moon within a beam that's only about 1.1 degrees in size. With the Sun this was not a problem, but the Moon doesn't throw much of a shadow! We've bought an inclinometer on ebay, to help with the pointing, but it hasn't arrived yet.

There are some more photos available at:

<http://www.crya.unam.mx/~s.kurtz/AVITH-FOTOS/>

sorry, I haven't figured out yet how to put in thumbnails, so you have to look at them one-by-one. --stan

## VIII. Radio Astronomy Basics

### Converting Times and Angles

- I. Here we show how to convert a time expressed in terms of hours, minutes, and seconds into a time expressed in decimal form and vice versa.

**Case A: Given time = 2h 43m 23 sec.**

Step 1) Convert seconds into minutes by dividing 23 by 60, obtaining 0.3833, and add these to the minutes, obtaining  $43 + 0.3833 = 43.3833$  minutes.

Step 2) Now divide these minutes by 60 to obtain hours in decimal form. That is,  $43.3833/60 = 0.723$  hours.

Step 3) Finally, add this to 2 hours, obtaining 2.723 hours.

**Case B: Given time = 17.4222 hours**

Step 1) Convert 0.4222 into minutes by multiplying by 60, obtaining 25.332 minutes.

Step 2) Convert 0.332 into seconds by multiplying by 60, obtaining 19.92 and round off to 20 seconds.

Step 3) Now write 17 hours 25 minutes 20 seconds.

- II. Here we show how to convert an angle expressed in terms of hours, minutes, and seconds of arc into an angle expressed in decimal form and vice versa.

**Case A: Given angle 2 hours 43 minutes 23 seconds of arc.**

Step 1) Convert arc seconds into arc minutes by dividing 23 by 60, obtaining 0.383 and add this to the arc minutes, obtaining  $43 + 0.3833 = 43.3833$  arc minutes.

Step 2) Now divide these arc minutes by 60 to obtain hours in decimal form. That is,  $43.3833/60 = 0.723$  hours.

Step 3) Finally, add this to 2 hours, obtaining 2.723 hours of arc.

**Case B: Given angle = 17.4222 hours of arc.**

Step 1) Convert 0.4222 into arc minutes by multiplying by 60, obtaining 25.332 arc minutes.

Step 2) Convert 0.332 into arc seconds by multiplying by 60, obtaining 19.92 and round off to 20 arc seconds.

Step 3) Now write 17 hours 25 minutes 20 seconds of arc.

Reference: [Radio Astronomy Projects](#); William Long

## IX. Notable Quote

“From the intrinsic evidence of his creation, the Great Architect of the Universe now begins to appear as a pure mathematician.”

--James Jeans 1877-1946; The Mysterious Universe (1930)

## X. Links to Radio Astronomy Resources

### A. From Jim Brown, SARA Mentor

Something new folks might like to listen in to.

SOMETHING NEW: For the new year, Spaceweather.com is pleased to announce a new service: Space Weather Radio, broadcasting live "sounds from space" around the clock. Now you can listen to the Air Force Space Surveillance Radar in Texas. When a meteor passes over the facility--ping!--there is an audible echo. Activity should be high during meteor showers. In the near future broadcasts will be added of solar radio bursts and VLF signals from the ionosphere. The streams are punctuated by Daily Space Weather Updates from Dr. Tony Phillips. Click here to begin listening:  
<http://SpaceweatherRadio.com>

### B. From Cliff Bates KC7PPM [crcwnet.com](http://crcwnet.com)

A Basic Primer on Setting Up An Amateur Radio  
Radio Telescope; 17 Pages

“This is a primer about getting started in Amateur Radio Astronomy (RA), and is mostly based on the school of hard knocks and mistakes I have made over the last 4 years since I have been interested in RA. Hopefully, after reading this, those of you who are up and coming will not repeat my mistakes and thus save yourselves not only a bit of frustration, but considerable money.”

C. Radio Jove web site: [radiojove.gsfc.nasa.gov](http://radiojove.gsfc.nasa.gov).

D. International Year of Astronomy: <http://astronomy2009.us>

E. Society of Amateur Radio Astronomers: [www.radio.astronomy.org](http://www.radio.astronomy.org)



## **XI. A Professional-Amateur Dialogue**

Amateur vs. Professional Radio Astronomy

by

Rodney Howe, Stan Kurtz (UNAM, Mexico) and David Fields (Roane State Community College)

Editor's Note: Stan Kurtz has been gracious to give some of his professional time and ideas in reviewing an interesting amateur radio astronomy research proposal submitted by Rodney Howe in the December, 2008 Issue of the TAOSON Signal ("Looking for Collaborators to Work on A Research Project for Dark Matter Detection"). Also, thanks to David Fields for review, editing, and comments. The rare interactions between professional and amateur radio astronomers can be very valuable and greatly benefit the amateur community by giving a deeper and grounded scientific perspective to original amateur concepts.

Rodney started the discussion by sending a nice letter to the Signal describing a radio astronomy research project and inviting people to collaborate. Follow-up correspondence between David and Stan has been woven together as a narrative.

Rodney suggested..."it may be that the HI clouds represent a form of cold 'dark matter' in the Milky Way."

### **The following is Part II of the professional response which began in the February, 2009 TAOSON Signal.**

Stan pointed out the need to estimate the magnitude of the effect: As a starting point, one ought to know what level of polarization is expected. 10%? 1%? 0.1%? 0.01%? It's like measuring voltages: if you're expecting signals around 5 volts, then a digital multimeter from Radio Shack will probably work fine. If you need to measure nanovolts, then a very different instrument will be needed, you'll have to worry about how the physical connection is made, localized electric fields, and so on. One could spend years looking for an effect that is too small to be measured with the available equipment. People (like Tom Troland and Carl Heiles) have spent decades using the Arecibo 1000 foot telescope and the Very Large Array to observe hydrogen as a probe of Galactic magnetic fields. They have done all of the obvious things, and a lot of non-obvious things too. You can see some examples on the 'Recent Research' link on Carl Heiles' home page, or do an ADS search on Troland .AND. Heiles as authors. (The search page for ADS is: [http://adsabs.harvard.edu/abstract\\_service.html](http://adsabs.harvard.edu/abstract_service.html) )

David commented on why measurement of the B field might be interesting: That question is interesting from wondering if the residual B fields would show the history of Milky Way interaction with other galaxies. There appear to be residual gas structures that look interesting and that show up in the HI distribution. If we could see the B fields, it would be fun to see if they were correlated. Not that an amateur observation would be the way to go, but Rodney has a big professional size dish (not quite Arecibo, of course).



David continued: Stan, your letter points out the problem with amateur work - we don't have the perspective or depth that the professional brings to the table. We should probably be more working with the professionals. So the amateur would have fun building the equipment and making measurements, but the research that s/he does with it would be to some extent guided by the gaps in knowledge, chosen with a professional perspective. Exceptions:

- things done for self-education
- things done for fun
- things done as outreach or stimulation of others
- things done for technical challenges

All those things are fun, of course, and the amateur can do things for fun that the professional doesn't have funding or inclination or sometimes, the knowledge to do. But we need a lot of help from the professional community to upgrade our thinking and choosing our focus.

Stan said that this was insightful, and replied:

I think you hit the nail right on the head, David! There's absolutely nothing wrong with repeating things that the professionals have already done - it can be educational, a lot of fun, great outreach, etc. And there *are* valuable research projects that can be done by amateurs. But there probably should be some coordination/consultation between the amateurs and the professionals to be sure that the projects proposed are well-conceived and well-designed.

If you want to do something new – something that would have make an astronomical contribution – then it would be better if the project were on some topic that doesn't receive a lot of attention from the professionals. Said another way, it would be better to complement what the professionals do, rather than trying to compete with them at something they're already doing. Galactic HI, rotation, magnetic fields, and dark matter are all very active research areas for the professionals and it's unlikely that amateur groups can make substantial contributions to these areas. Perhaps it might be done for fun – but not with an expectation that it will make a scientific contribution.

As an example of a topic where amateurs *could* make a real contribution, I'll describe a project to monitor masers, searching for periodic variability:

Masers are just like lasers, but with “microwaves” instead of “light”. They are very bright sources of microwave radiation, and hence would be somewhat easier to observe than other, weaker astronomical sources. Various molecules are known to emit maser radiation, including water, hydroxyl, ammonia, methanol, formaldehyde and silicon oxide. Although many of these molecular masers are variable in the intensity of the emitted radiation, to my knowledge, only methanol and formaldehyde have shown PERIODIC variability. Goedhart and her collaborators have used the South African 26-meter telescope (at Hartebeeshtoeck Observatory) to monitor 53 methanol masers. They found periodic variability in six of these, with periods ranging from 133 to 504 days. The cause of the periodicity is unknown. Probably the most important task is to figure out WHY these masers are periodic. However, that is probably a job for professional astronomers, with access to large telescope facilities. (Of course, theory is cheap – and anyone can try their hand at that!)

Although a sample of six periodic masers is a reasonable number of sources to work with, a very worthwhile activity would be to search for more periodic masers – either by expanding the sample from the original 53 or by looking at other molecules or transitions in search of periodicity. For example, Goedhart et al. were studying the 12.2 GHz line of methanol; one could study the 6.7 GHz line, or the 23.3 GHz line, (in the six known periodic sources) to see if these transitions are also periodic. Or, one might look at formaldehyde or OH to see if it is periodic in these (or other) sources. Long-term monitoring programs can be difficult to get time for on professional telescopes, but this would not be a problem for amateur telescopes. Moreover, the variability could easily be on the order of 50% - 100%, which would be fairly easy to detect. Also, by observing a standard source in each observing run, the data could easily be normalized, so that instrument drift over timescales of days to months could easily be corrected for.

Such a project would present some real challenges, but ones that can probably be solved by a dedicated amateur group. And if periodicity were found, it would be a real and valuable contribution to scientific research.

Since you can't get your mind off of magnetic fields, David, another project that might be promising would be to use pulsar dispersion measures to map the magnetic field of the Galaxy. This – or other pulsar studies – would also have the advantage that they can be done at fairly low frequencies, which would match up well with the equipment available at DSES or other amateur observatories. Also, there's a lot of potential to use software-defined radio or field programmable gate arrays to process the pulsar information. These are areas that only a few professional radio astronomers are delving into, and there's a lot of potential for contributions from the amateur community,