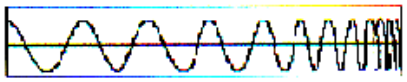
TAOSON



Issue 1. September 2008

Director David Fields
Editor Bill Seymour
Guest Ed. for this issue. David Fields

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 two meetings per month, and assist each other when needed. Most members support the Society of Amateur Radio Astronomers (see 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 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. Otherwise, membership is still free and you are invited to help with our projects.

Meetings

Regular monthly meetings are held on two occasions -- the 1st Saturday afternoon (2 PM at TAO) and 3rd Sunday afternoon (2 PM at SkyNet) of each month. Special meetings will be called as the need arises.

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.

The TAOSON Signal

David Fields, N4HBO

Our newsletter, the TAOSON Signal, will be informative, monthly and probably short. As suggested by the Editor, the Signal will be published and distributed via e-mail on the first day of each month. This issue was edited by Guest Editor David Fields and proofread by Linda Fippin. Bill requested that I handle addresses, so send me email addresses of people who should receive it. I'll make every effort to protect the addresses and the privacy of their owners. Our Editor will send me the Signal and I'll email it. Feel free to circulate and share copies of the Signal.

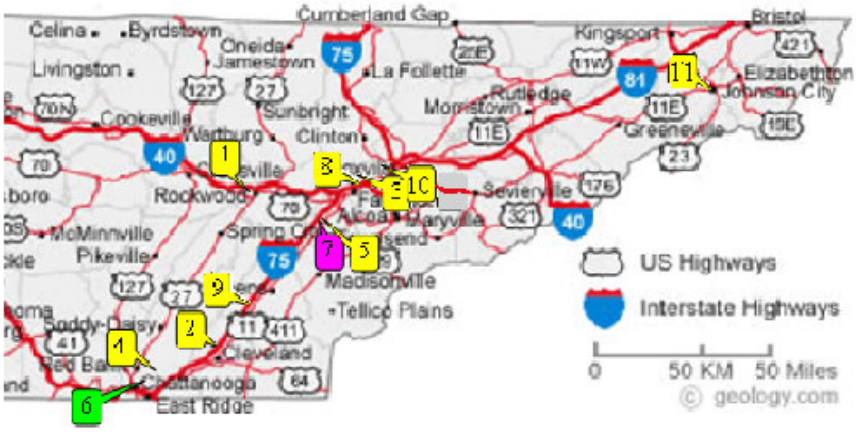
Items for the newsletter will be submitted by email to both Editor Bill Seymour at swafseymo@bellsouth.net with a copy to David Fields at fieldsde@aol.com not later than ten days prior to the publication date. We encourage each active member (all TAOSON members are assumed to be active members) to submit a paragraph that summarizes site activities, goals and ideas.

Members are invited to submit questions to the Editor to be considered in the newsletter and at meetings.

Research Site Locations and Capabilities

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

Site locations and primary capabilities are as follows:



TAOSON FACILITIES DIRECTORY

Site Location	Site Name	Code	Control Operator	Lat./Long.	Telephone	Operations
Rockwood (1)	TAO	TAO	David Fields	35.8322/ 84.6175	865-376-1362	21cm, 15m, optical, Ku, Spectrocyber, Interferometer
Cleveland (2)	Skynet	SN	Bill and Melinda		423-478-9045	21cm, 15m, optical, Ku, Spectrocyber, VLF
Solway (3)	Solway	SOL	David Fields	35.9641/ 84.2021	865-927-5155	15m, Ku, optical H-alpha VLF
Chattanooga (4)	Riverbend	RB	Dick Castle		423-870-4398	15m
Knoxville (8)	Blue Meadow	BLM	Linda Fippin		865-539-6826	VLF
Niota (9)	Niota	CL	John Mannone		423-337-2197	Ku, optical, VLF
Hixson (6)	Big Ridge	BR	Bill Seymour		423-870-8552	15m, Ku, optical VLF
Lenoir City (5) (7)	Lenoir City	LC	Aaron Haun		865-986-7153	Server
Karns	10 Karns	KA	Carl Lyster			SpectraCyber, VLF
Johnson City	11	JC	Heather Fries			Quantitative Optical, SID planned
Puerto Rico		PR	Wanda Diaz			Spectrocyber, 15m
UNAM, MX		UN	Stan Kurtz			SRT, Homebrew IBT, SpectraCyber, 15m

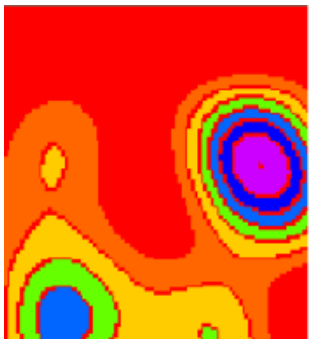
TAOSON Site Reports

TAO **David Fields, N4HBO**

TAO is described at www.roanestate.edu/obs . Free Public Skygazes are conducted on the 1st and 3rd Saturday evenings of each months and TAOSON members are invited. The 1st TAOSON meeting of the month will be at TAO at 1400 h (2 PM), well before the stargaze scheduled for 1900 h.

TAO is our primary meeting and workshop site. Capabilities include SpectraCyber, Jove system, IBT, Ku interferometer, and meteor bounce, plus some optical stuff 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 (see Heather's note).

The Ku band interferometer has also been used recently for mapping – this plot shows (left) 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 on the (right) shows the pretty night sky during the Perseid shower at 4 AM on August 12.



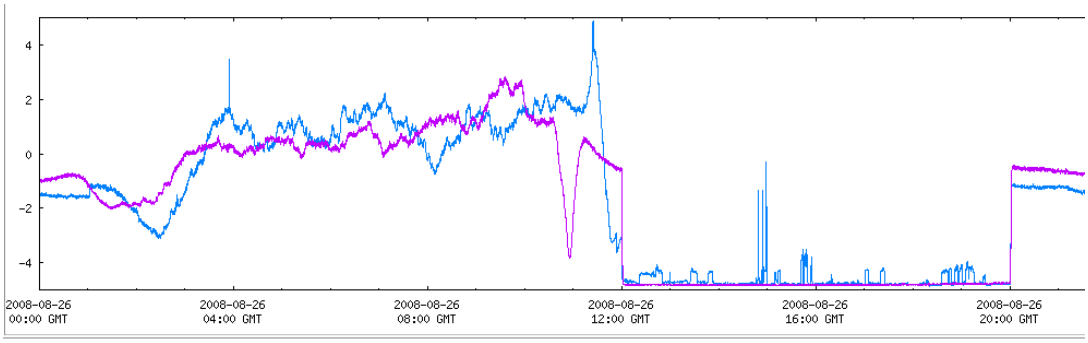
SkyNet **Bill & Melinda Lord**

We are just getting our web page completed, www.tnSkyNet.com. Check it out and let us know what you think.

We are already making changes to our SpectraCyber set up thanks to help from Carl Lyster. We are putting in a better coax cable and we will be getting a 10 foot C-band dish from a neighbor (free for the taking) when the weather cools a bit more. These two changes should really improve our ability to monitor hydrogen in the Milky Way. While we are making these changes we will be installing the calibrator.

We are working on a dual dipole antenna with Dick Castle that is portable and easy to set up for Radio Jove. We demonstrated the single dipole antenna to the Scenic City Amateur Radio Society (SCARS) when they visited our site in August. The poles are fiberglass sections about 4 foot in length that fit into each other. We can experiment with tilting the antenna and compare reception against our fixed dual dipole. We will report on that later as we get more of it completed.

We have been collecting data on the SID receiver and uploading daily to the Stanford University web page. Check out KARNS data at http://sid.stanford.edu/database-browser/. We have not detected any flares yet, but the unit is running good and seems to be calibrated correctly.



[Shown above is recent VLF data from Skynet.]

UNAM **Stan Kurtz, N9GKX**

[Lots happening with the SRT, SpectroCyber, and a home brew version of the IBT! Report next month.]

RiverBend **Dick Castle, K2IMH**

[Lots happening here – see the writeup under TAOSON PROJECTS, JOVE project!]

Karns **Carl Lyster, WA4ADG**

[Lots happening here – mods to SpectraCyber, noise calibrators, new receiver designs etc.!]

Blue Meadow **Linda Fippin**

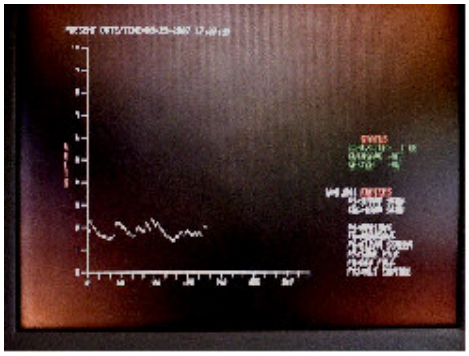
At last year's SARA conference, I became intrigued by the idea of amateur observation of our sun's activity using a home-built Gyrator II detector for sudden ionospheric disturbances. Having been assured by the SARA presenter, John Wallace, that building the detector was a "simple project," I decided that I would test the limits of the word "simple." I am a true beginner in the radio field, having little to no experience with radio or electronics. The project has languished for more than a year, having not progressed beyond the acquisition of the materials displayed in the attached photo. However, after seeing Bill and Melinda's impressive radio observatory, I am feeling energized (and maybe a little intimidated) again, and hope to have made some more tangible progress by the time the next newsletter comes out.

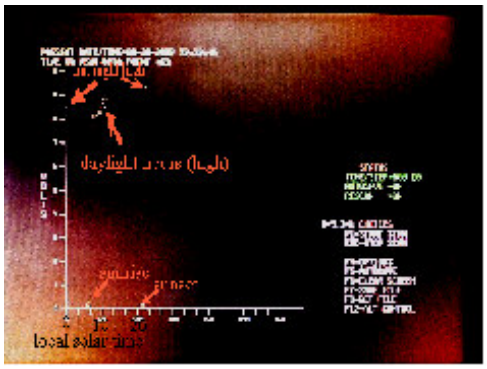
Solway **David Fields, N4HBO**

Solway has served as a Jove monitoring site/server using the G5RV multiband dipole antenna. We also have some Ku band interferometer parts and a well-used IBT that has been enjoyed by a lot of people, and a small optical observatory with an 8" SCT scope. "Big Red" is a 3m dish that is Alt-Az steerable but does not have the feedback loop and control circuit installed. Here, on the left is TAOSON founder Tyler Moore with Big Red. On the right is Moby Dish, a 4.5m dish with point motors and counterweights just installed and debugged.

Cantilevers and counterweights are not installed in this photo. Moby Dish is sited to cover the entire visible ecliptic and is located in a radio-sheltered valley.

Solway also has an operating GID (Global Ionospheric Detector) that records the 40 kHz terrestrial radio background using a 60m horizontal antenna. The left photo is an example of a 1s-resolution trace that spans several minutes. This trace was recorded on 25 August. On the right is a photo from Aug. 28 that shows 24 h of data and with an unexplained (interference?)





peak near midnight. Subsequent observations showed that this peak shows up most nights.

Big Ridge Site **Bill Seymour, KM4YL**

Report on the Big Ridge Site (named after my geographical location in Hixson);

--SID
Accepted into the Stanford University Program in March. Received a receiver from them in June. Acquired a SID antenna, constructed by Bill Lord and Dick Castle, in August.

--RADIO JOVE
Initially, plan to use the Ten Tec 15M receiver kit, constructed and modified by Bill and Dick. will construct a Radio Jove receiver kit in the near future. Plan to put up a Radio Jove dipole by October.

Melinda Lord is acquiring a used computer with com port for my site and will set it up initially with software for SID and RADIO JOVE.

The advanced receiver (HP 3586C, Selective Level Meter) which I acquired from SARA member Kerry Smith has the capability to do both SID and RADIO JOVE work. Its vast possibilities also need to be explored for other things, too. Jerry Moore, a ham radio operator in the SCARS club that Dick and I belong to has indicated an interest in taking the HP receiver and seeing what it can do. He is an electrical engineer with a strong interest in short wave radio, is a few months away from retirement at TVA, and will have the time to work on such a project. Also, this will be a way of hooking him deeper into TAOSON. He was one of the ham radio operators who attended the open house at SKYNET Observatory and appeared to be fascinated with what was going on.

Long term, I still want to construct a "quad-yagi" based on the design at TAO (I have the plans) and monitor cosmic radio bursts. This is a very strong interest of mine.

Niota **John Mannone**

The IBT (Itty Bitty Telescope) is a digital TV satellite dish, modified for radio astronomy (12 GHz). However, this microwave telescope is often used simply to introduce radio astronomy: detection of the sun, numerous Clarke belt satellites, as well as terrestrial “black body” radiators like trees and people. However, with a target audience of High School and College physics students, Mannone has extended the boundaries beyond what is typically done. And some of these are for science applications that are not astronomy-related:

(1) Analysis of Geosynchronous Parallax: A Problem in Geometry—
Satellite Identification and Calculation of Satellite Distance
(2) Observing Microwave Emission from the Galactic Plane
(3) Investigation of Geosynchronous Satellite Spin from Spectral Analysis of Mechanically Induced Vibrations that Modulate the IBT Signal
(4) Designing Kinematics Experiments using the IBT: Speed of Birds, Cars, and Trains; Thermal length of Cars; Dynamic Demonstration of $1/r^2$ Law

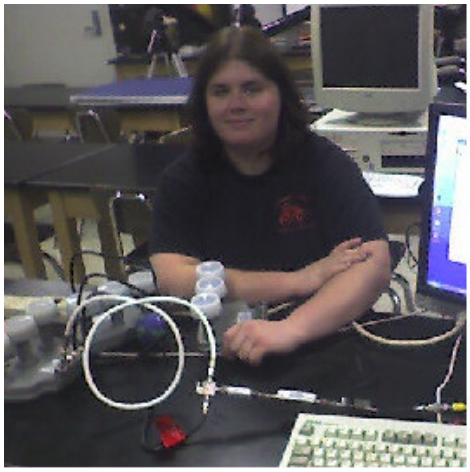
Other experiments and demonstrations that are planned:

(1) The Lunar Microwave Signature (includes Sighting Device Design)
(2) IBT Tracking of the Sun with a Telescope Mount to Study Microwave Emission as a Potential Precursor to Solar Flares
(3) Refined Observation of Microwave Emission from the Galactic Plane
(4) A Microwave Probe of the Ionosphere Using Digital Satellites and Ionospheric Scintillation
(5) Differential Thermal Probe used in Conjunction with Audio Spectral Doppler Shift of Approaching Train
(6) Microwave Pyrometer: The Blackbody Emission of Warm Black to White-hot Charcoal
(7) Radiative Cooling of a Hot Object: Caldrons to Coals
(8) Other Thermal Experiments: Power Line Microwave Emission from Joule Heating, Microwave emission from Broadband Arcing at Electrical Substations
(9) Optical Photography of Geosynchronous Satellites to Accompany Radio SkyPipe Traces

Johnson City **Heather Fries**

Measuring Neutral Hydrogen Clouds Throughout the Sky. This was my project at Tamke-Allan Observatory that lasted for about a year. Basically, I used a 2m dish and the program SpectraCyber to take measurements (through declination) each day. With my data, I created a VLCB (very large celestial ball), plotting the hydrogen atoms on it and showed if hydrogen atoms are coming towards us or moving away, using red/blue Doppler shift. The dish catches the signal once a hydrogen atom flips, which takes an extremely long time. What is amazing is realizing how many hydrogen atoms there actually are, because there is so much signal. This is just an amazing project because radio astronomy can discover so much more. I hope to pick this project up again or at least show someone else how to do it.

I am now in good ole' Johnson City, at ETSU, majoring in physics. I am really excited because I am going to be the lab assistant here for astronomy. My goals now are to start a Radio Jove program here and really get into astronomy outreach. I am going to get into more sidewalk astronomy as well.



[On the left is Heather receiving the outstanding Astronomy Student Award and the Student Government Award from Roane State. On the right, she is working on the amplifier string of the TAO Interferometer. This photo has more LNBs than any I have ever seen.]

Puerto Rico **Wanda Diaz**

In 2004 a group of radio astronomers volunteered to bring science closer to every learner. No matter what learning style a human being may have, that learning style may be used to do great discoveries and contributions to science and for instance culture and society. Albert Einstein and Mozart are just two of many examples.

In Puerto Rico we named this initiative Shirohisa Ikeda (eternal castle) on behalf of a fellow who had impairments and died here at a young age. Together with David Fields, John Mannone, Ercyes University, Politecnica University, and Glasgow University we do radio astronomy research using all the abilities of people. We as human beings are natural antennas collecting data from the environment. We share with TAOSON the goal of research and humanistic science. It is for sure that a brilliant future lies right here beside us!!!

[Here is Wanda teaching at the Beneitez school. Behind her on the right is her IBT and below, some of her students with an astronomy project.]

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.**

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. Hixson, TN –Being built not operational yet- 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, we have 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 radio shack or order a Channel Master 1040IFD tuning meter for under $80 on the web, build a base and you are ready t 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

TAOSON Blogs? **David Fields**

John and Melinda are considering a TAOSON blog. I've suggested that the SRSS server probably won't handle it well since the line is already well-utilized by the Haun family's several computers, the server running SaveRoaneStarrySkies editing and site hits, plus our TAOSON data uploads. If anyone starts doing blog editing on the TAOSON server, we'll miss completing our TAOSON uploads and downloads. It's not a fast computer, and their line is not the highest speed. They are considering other computers. But we could do this on another computer!

I considered the blog thing awhile back but decided that most people will read emails, but they won't keep up to date with blogs. In fact I occasionally monitor a few blogs, but not all that often. So I put the idea aside. Still, I confess that it might be fun. I'll contribute sometimes if they want to try it. Maybe we should consider Twitter, sort of a cross between a blog and SMS. It's becoming popular and makes updating very fast and easy.

I personally think that a more interesting idea than a blog, is a Wiki. We could even use a Wiki to do our newsletter. There are some free Wiki sites, by the way, with whom we could register, so I think that they consider these possibilities and let us know in the next issue of the Signal.

Anyone wanting to pursue a TAOSON blog or Wiki – please contact John or Melinda.

TAOSON history and 2008 meeting notes

TAOSON was conceived of by Tyler Moore, David Fields and Heather Fries in early 2007. TAOSON was a local network of solar and Jupiter monitoring stations. Stations were operated at TAO, at Midway, and in Solway. Frequent meetings were held to coordinate activities. Tyler and Heather gave presentations on TAOSON at the SARA meeting in 2007 and Tyler was awarded a student grant to setup a portable station. This paid for a PVC case, which we setup at various locations along with a computer and receiver. Tyler also presented our projects at the student session of the Tennessee Academy of Sciences in 2007.

In 2008 we decided to open the group to non-students. At our **first meeting** of the larger group, held at TAO, we decided to establish regular meetings, coordinated via email and our newsletter. We discussed ongoing projects and duties. Temporary Officers were David Fields, Director, Bill Seymour, Newsletter Editor and our various site coordinators (please see the Table of TAOSON sites). [We now have a backup editor to assist when needed, but the position of Backup Editor will probably rotate.] We agreed to move toward saving synopses of our data on a server. We decided to not require dues for now and to distribute the newsletter by email. [We need to choose a recording secretary who will take minutes of our meetings, etc. We also need a publicity person who will find new members for us.]

At our **second meeting**, at TAO, Bill Lord brought some TAOSON bumper stickers. We discussed Jove receivers and problems and solutions with the IBTs. In TAOSON we have 3 IBTs, with two in frequent service. Our new server will be on the SaveRoaneStarrySkies computer where Aaron Haun is webmaster. We discussed the coming newsletter.

Our **third meeting** was a series of conversations at the NRAO facility in Green Bank, NC, where eight of our TAOSON group were in attendance. We started assembly of materials for the newsletter.

Our **fourth meeting** was at TAO, where we performed noise calibrations on two Jove receivers. We performed least squares fits to the receiver sensitivity values so we can express signal strengths as noise temperature.

Our **fifth meeting** was held at the SkyNet facility in Cleveland, where we enjoyed a tour and worked with setting up both the SIDs receiver and the SpectraCyber.

Our **sixth meeting** (not a full TAOSON meeting – just invited hams) was again at the SkyNet facility in Cleveland, where Chattanooga radio amateurs were invited to visit the facility and learn some of the capabilities of amateur radio astronomy. This newsletter is being routed to them.

Our **seventh meeting** was again at SkyNet, where we discussed upgrades of SpectraCyber, and looked at the beautiful SID data being collected. Another topic was preservation of audio settings using QuickMix. QuickMix was suggested by Aaron and tested at SkyNet. It is now in use at SkyNet and at Solway. We decided to hold two meetings per month. The first meeting will be on the first Saturday at TAO at 1400h and the second meeting will be on the third Sunday

at SkyNet. We are discussing establishing a blog to supplement emails. We are missing our newsletter and resolved to get it started immediately.