The Deep Space Exploration Society 2018 Perseid Meteor Shower Open House

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Deep Space Exploration Society

Introduction:

The Deep Space Exploration Society held an open house at its Paul Plishner Radio Astronomy and Space Science Center near Haswell, Colorado on August 11-12, 2018 in conjunction with the Perseid meteor shower.

Figure 1: Paul Plishner Radio Astronomy and Space Science Center

- Tours and educational programs were offered.
- Demonstrations and radio experiments utilizing the 60 Ft. Radio Dish were undertaken.
- Ham Radio operation and the club station, KØPRT were demonstrated.
- Radio Astronomy and Optical Astronomy were demonstrated. Solar Telescopes were available to view the sun. Other optical telescopes were available during the evening hours. The annual Perseid meteor showers were observed when conditions permitted.
- Hot dogs were served for lunch and homemade Brunswick stew and jalapeno corn bread was served after 5PM. Coffee, ice water and lemonade were available throughout the event.
- Overnight camping was permitted, and RV/trailer power hookups were available for a small donation fee.

Highlights:

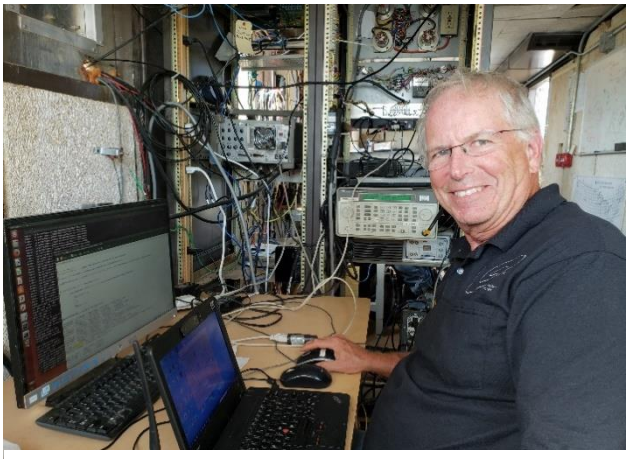


Figure 2: Skip Crilly with the SETI system

Skip Crilly of the Green Bank Radio Observatory and a benefactor of the DSES Paul Plishner Radio Astronomy and Space Science Center traveled to Haswell, Colorado and set up the GPS Time Base and receivers for joint observations with the Green Bank Observatory in West Virginia.

The observation of NRAO 5690 a catalogued supernova remnant (SNR), following the open house, showed that Skip's "Geographically-spaced Synchronized Signal Detection System" could accurately detect and correlate emissions from weak distant objects. and is a good verification of the two systems observing together. See Green Bank & Haswell plots of simultaneous observation of NRAO 5690 on August 15, 2018 and the plot below

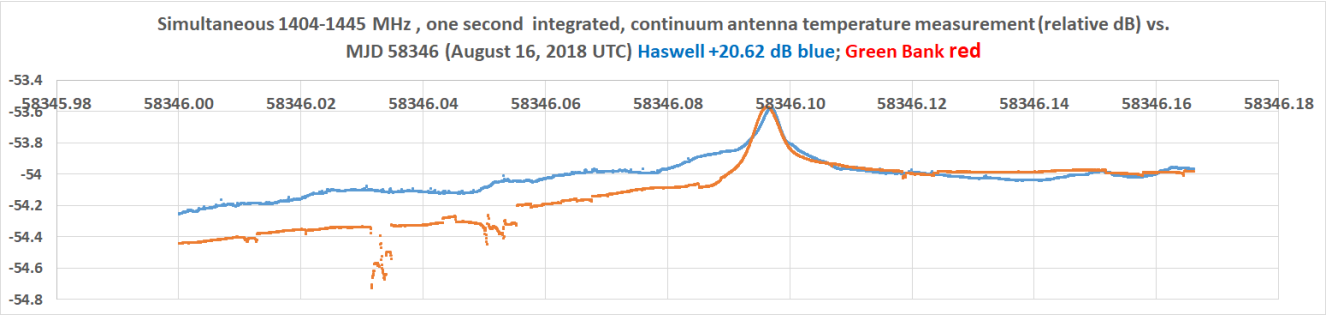


Figure 3: Amplitude corrected Green Bank & Haswell plots of simultaneous observation, August 16, 2018

Skip Crilly also gave a slide show in the underground bunker to about 20 of the open house guests and members including parts of his paper "Geographically - spaced Synchronized Signal Detection System" (click link for presentation slides).

Figures 4a and 4b: Skip Crilly, Presentation on "Geographically-spaced Synchronized Signal Detection System"

Open House Observations Using the 60- foot Dish Antenna:

The DSES and Society of Amateur Radio Astronomers (SARA) teams installed three different receivers onto the 60-foot dish during the open house.

1. Successful Installation and Testing of the DSES Spectracyber Neutral Hydrogen Receiver

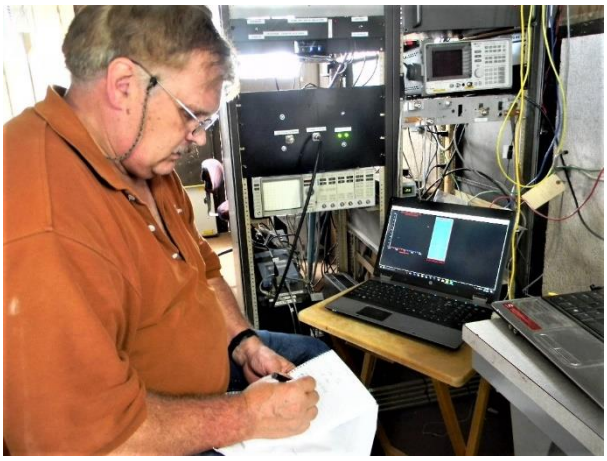
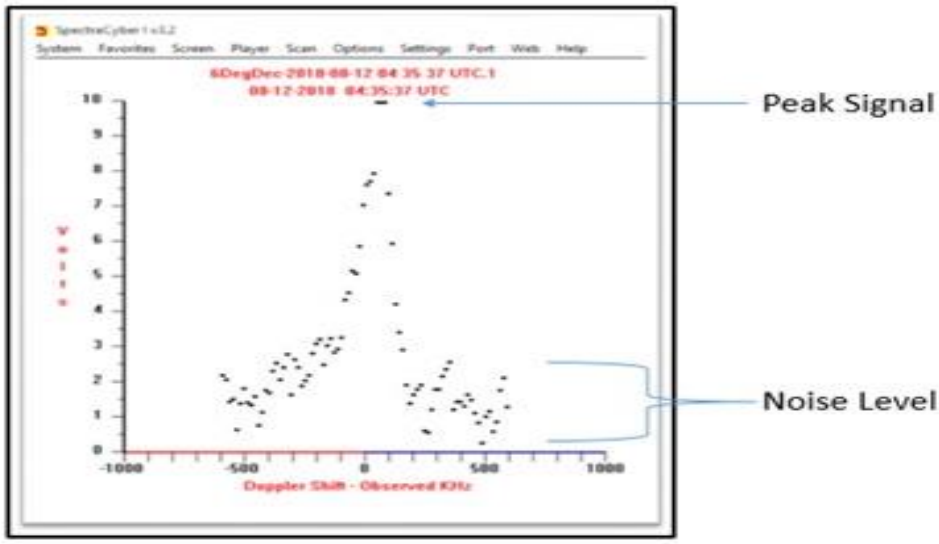


Figure 5: ***Dr. Rich Russel operating the Spectracyber HI Receiver on the 60 ft Dish***

The Spectracyber was installed on the 60-foot dish during the DSES Open House on August 11, 2018. The Spectracyber measures 1420.406 MHz +- 600 KHz. The observation was taken while passing the galactic plane at RA: 19hr 5 Min, Dec: 6 degrees 0 Min.



Passing the Galactic Plain RA: 19hr 5 Min, Dec: 6 degrees 0 Min

Figure 6: Spectracyber Amplitude vs Frequency Plot

The observation shows a significant signal to noise ratio as seen below. Follow-on observations will allow for measurement of the rotation rate of the Milky Way and Solar System!

2. RASDR4 Receiver Successful Observation of Hydrogen Absorption Line

Figure 7: Tony Bigbee operating the RASDR 4 on the 60 ft Dish while Ed Corn, Paul Berge, and Bill Miller look on.

Tony Bigbee used his RASDR4 on the 60-foot dish to observe this hydrogen absorption line at RA: 18.15hrs, Dec: -20 deg. Tony installed a RASDR 4 system using the Lime SDR HW and the SW that he developed. His experiment goal was to replicate results obtained using the NRAO 20-meter dish system and RASDR2 achieved in 2014 as well as compare results with a recent survey involving the Parkes 64-meter dish system to see the hydrogen line energy absorption of the Sagittarius Star Cloud Messier 24, with a colder hydrogen cloud in the line of site that absorbs the background hydrogen line signal. The results were stellar! The neutral hydrogen frequency absorption could be clearly seen as a V notch in the spectral curve of the background source emission. The 60ft. dish was moved to lead the passing object several times and the notch could clearly be seen Tony will publish a paper on this observation.

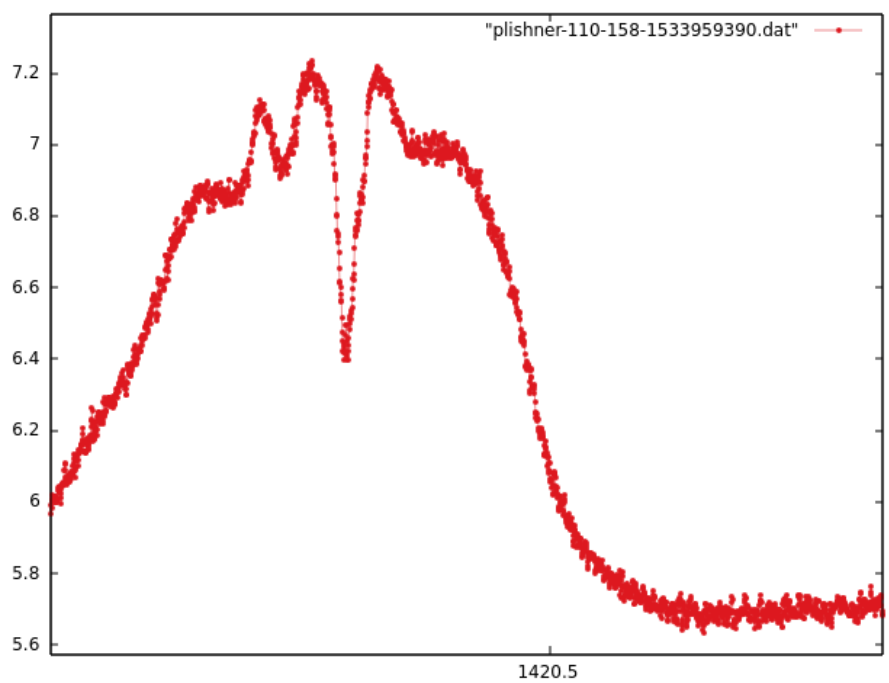


Figure 8: RASDR 4 Detection of the "Dark Cloud"

3. 1296 MHz Beacon Observation Using a RASDR2, Software Defined Receiver

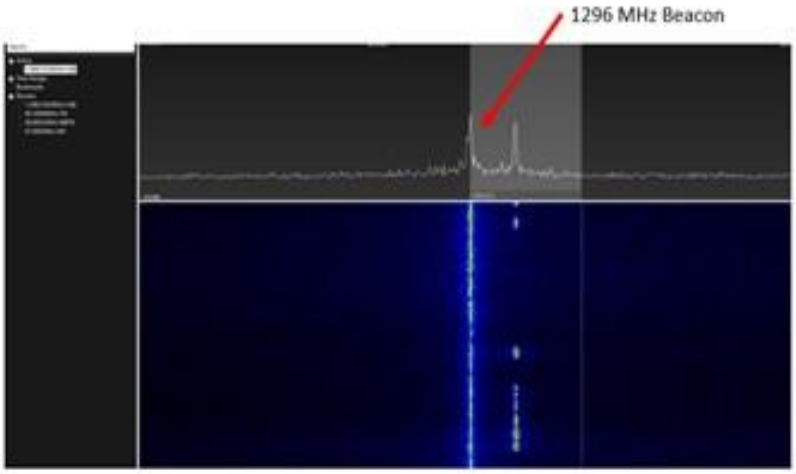


Figure 9: 1296 MHz Beacon Observation using a RASDR2

SARA members **Bogdan Vacaliuc and David Fields** drove out from San Jose on the way back to Tennessee and tried their RASDR2 on the system feed. **Bogdan Vacaliuc** installed a RASDR2 onto the 60-foot dish and was able to observe Ray Uberecken's 1296MHz 10Watt beacon from 80 miles away and was at least 20dB over noise even though the dish feed is designed for 1420MHz.

This also allowed us to center the signal by moving the dish back and forth in azimuth and at 0 deg elevation with both pointing systems 1 and 2.

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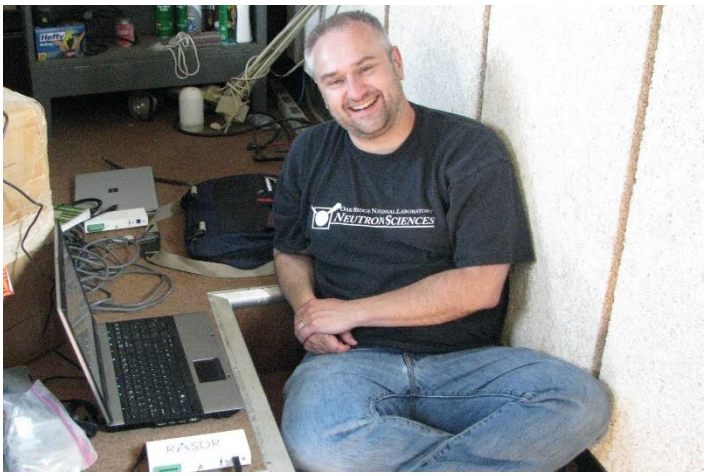

Figure 10: Bogdan Vacaliuc with the RASDR 2 installed on the 60 ft dish

60 ft. Dish Operations:

The two control systems that tell where the dish is pointing were exercised in the open house and both worked quite well. **Paul Berge** solved one of our dish drive problems in preparation for the open house. The mount brake solenoid circuit breakers had been tripping, and he replaced them with time delay fuses and the system was solid during and after the open house event.

Figure 11: Bill and Rich operating the dish controls

Both pointing systems 1 and system 2 were found to be within about 2.5 degrees of each other in Azimuth and Elevation with the RASDR2 and 1296Mhz beacon test described above. More work to do here on pointing accuracy.

Bill Miller and **Dr. Rich Russel** operated the 60 ft. dish using the manual controls on the rack panel and steered it to points of right ascension and declination using the pointing calculations of the system 2 controller and attached computer. They used this to perform many of the observations and experiments described above.

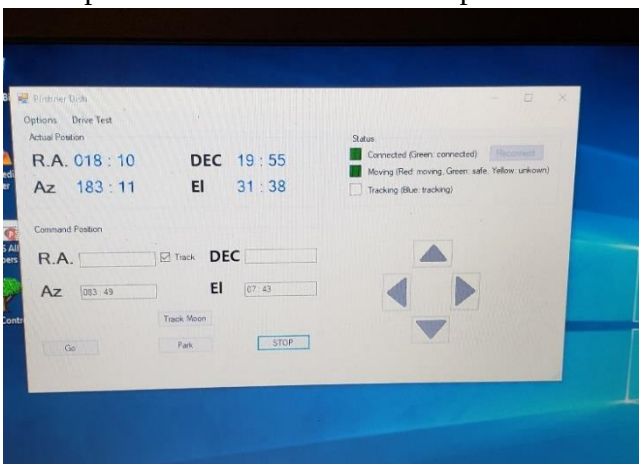

Figure 12: Dish Pointing Control Graphical User Interface

Ham Radio and Club Station Operations:

Figure 13: Site Ham Station, KØPRT

Gary Agranat operated and demonstrated the Site Ham Station, KØPRT from the "Underground" bunker to all the visiting guests. He logged over 150 contacts. Over 60 contacts were on 20-meter phone. The rest were on 10, 15, 20, and 40-meter FT8. Gary advertised the special event station in the August QST and at ARRL.org since May. Plus, while on the air the event was spotted on the DX cluster. Those ads and sightings brought in more contacts. Since installation 2 years ago, Gary and the club have made over 600 radio contacts from the site. Gary had many phone contacts in a short time. He suggests in the future more of the members take a turn at the ham station. We could get many more contacts with more hours and operators and spread the load while giving other Hams a chance to talk with more of us and learn more about the various aspects of what we do. In the future, we could have 1 to 2-hour time slots scheduled for active members to share the responsibility

General Astronomy:

Figure 14: The wagons were gathered around the dish in preparation for nightfall

While many successful dish and radio experiments were going on, the DSES was also providing educational demonstrations to visitors on general astronomy and science subjects.

We did a lot on visual astronomy. Rich, Bill, Myron, Floyd and several of the guests brought out mid-sized optical telescopes and shared viewing with all that were interested. The "seeing" for optical observation with no moon was very good except for the wild fire smoke on the horizon. We didn't see too many meteors in the Perseids Meteor Shower, but this may be because the peak viewing occurred in the early AM hours. By then we were all exhausted and choose to sleep instead.

Figure 15: Rich Russel and Floyd Glick Sets up an optical telescope while Michael Lowe discusses it with guests

Figure 16: The Solar lights came on and the evening progressed with more optical and radio astronomy on into the night.

Food and Drink:

We did a good job of keeping everyone fed and caffeinated. On Saturday and Sunday mornings, Bill provided continuous coffee service.

For Saturday lunch Myron provided grilled hot dogs, fixings, potato and macaroni salads, with chips and drinks for lunch.

Saturday evening, Steve Plock provided his home-made Brunswick stew and Jalapeno corn bread in the underground prior to Skip's presentation. Everyone loved the stew.

Figure 17: Guests partake of Steve Plock's home-made Brunswick stew and Jalapeno corn bread

Figure 18: Myron Babcock and Dave Molter put on Breakfast

On Sunday, Dave and Myron put on a grilled egg, sausage, hash browns and pancake breakfast that really hit the spot.

General Pictures of this Successful Event:

Summary

The DSES 2018 Open House was a success! We hosted numerous SARA members as well as the general public of two nearby towns. We were able to track multiple astronomical sources using three different receiver systems on the 60-foot dish. The sky was clear and provided a clear view for the many telescopes. The food was great and the guest speaker, Skip Crilly, was a hit!

If you would like to join DSES, go to the website www.DSES.science to apply and keep up on the activities of the organization.

Special Thanks for Photos: Bascombe Wilson, Ed McCauley, and Gary Agranat