Pro-Am 3

Oct 26-27, 2013,
HBCSE, Mumbai

Session 1 : Radio Astronomy

Panelists *: Prof Bhalchandar Joshi (NCRA-TIFR), Kedar Soni (Abhinav Vidyalay), Prof Avinash Deshpande (RRI)*
Moderator *: Niruj Mohan Ramanujam (NCRA-TIFR)*

Initial remarks

Niruj Mohan Ramanujam introduced the session goals and the panelists, and talked about how amateur radio astronomy is no longer linked to ham radio but has, with modern cheap off the shelf instrumentation, moved on to building small radio telescopes making it a truly amateur initiative. He also mentioned that the first radio astronomer in the world, Grote Reber, functioned as an amateur radio astronomer.

Prof. B. C. Joshi spoke about Radio Physics Lab at NCRA and IUCAA and their development of the Affordable Small Radio Telescope (ASRT). The ASRT is basically a DTH dish, which can be used to look at the Sun along with a commercial satellite finder. The whole setup costs Rs. 2000. One can also add an analog-to-digital converter along with an amplifier to make it much better, with little additional cost. One can use this to study the variability of the Sun, using satellites as calibrators. BCJ is interested in being a part of a network of people across the country using the ASRT for this purpose. The RPL also has a 4m dish that can be used for other observations and is interested in working with college students in India to develop a network of dishes for very long baseline interferometry.

Kedar Soni spoke about his experiences in building simple radio telescopes with the students in his school. They have built a helix antenna and its associated setup within Rs. 5000. It works at 1400 MHz, and is calibrated initially using a CFL. Though setting it up and using it is easy, there is a need for some professional guidance too. They have used their telescope, which was set up for us to see during lunch, to observe Cygnus A, the Sun, solar flares, bright pulsars etc.

Avinash Deshpande spoke first about a simple experiment done by Nimesh Patel with his son, of building a horn antenna out of cardboard, aluminium foil and tin can, to replicate the famous experiment of Ewen and Purcell of detecting the Hydrogen line at 1420 MHz. He then spoke about his idea of helping design and build a network of arrays in science and engineering colleges across the country, which can be used to look for radio transients, which is a very hot research topic now.

General discussion

Hardware
Even a simple Yagi antenna is sufficient, which is easy to build. The kit by IIA can also be used and details should be put up on the website soon.

Software
We need to know what free software is available for use with these telescopes. Free software for, e.g. sound recording, can be used for our purpose too. Such s/w that can be adapted will need to be catalogues and described.

Resource material
Need resource material to be compiled, as well as basic introductory material. Like PN Shankar's book revolutionised optical telescope making in India, we need a similiar book for radio telescope making too.

Calibrators
At 11 GHz, with the ASRT, we can use satellites as calibrators. For other lower frequencies, the best thing is to use nearby buildings as a calibrator at ambient temperature.

Useful science
Looking for bright transients, which are one-time events, are extremely important scientifically, and significant advances can be made by amateurs, as in the network of arrays mentioned by Prof Deshpande.

Workshops
NCRA organises a Pulsar school at Ooty for college students and BCJ offered to organise one specifically for amateur astronomers. RPL at NCRA can also organise small workshops on basic radio astronomy instrumentation for smaller amateur groups.

Ways of engaging with radio astronomy
The initiatives described here are new and can be taken up easily by amateur groups. In addition, one can also do citizen science-like activities for radio too, e.g. Pulsar at Home. One can think of creating such projects in India too. Need to form a group of interested amateur radio astronomers, like SARA (Society for Amateur Radio Astronomers) in the west. One can also use archival data in useful ways, to be discussed in the Citizen Science session. Can some old data already taken be made available for amateur astronomers ?

Using professional observatories
Can amateurs use radio observatories effectively ? It is difficult, since they are oversubscribed, and go through a Time Allocation Committee but it may be possible

to reserve a small portion of time for use by amateurs, with a separate proposal system. However, since we are just starting such an initiative, this is a bit early to talk of such an option. However, one can think of such a thing as a followup of a specific workshop.

Action Items

1. A **website** for coordinating information about amateur radio astronomy initiatives. This would lead to forming an amateur radio group in the future. RPL can take the lead on this.
2. **Information on the initiatives** the panelists spoke about, to be put on this website, plus others like the IIA kit
3. A **standardised design** and instructions for a small telescope with receiver and recorder to be done and put up
4. A **list of simple experiments** than can be done with small radio telescopes
5. A list to be made of **free software** to be used for these projects, on the website.
6. A **basic book** on radio telescope making, similar to P.N. Shankar's book.
7. Organise a **pulsar workshop** for amateur astronomers in Ooty.
8. Can ASI ask observatories to set aside some **observation time** for amateur astronomers, through a suitable system ?
9. We need a proper way **to report** observations (generic)
10. **Citizen science projects** in radio astronomy in India using archival data available in institutes
11. Can ASI help in **sustaining links** between ams and pros (generic) ?

This document was compiled by Niruj Mohan Ramanujam (NCRA-TIFR)