

A Technical Note on Construction of Small Budget and Mobile Radio Telescope for Amateur and Initial Phase Observer

Singh Prashant

Atharva College of Engineering, Mumbai University, Mumbai, India

Abstract— An astronomical object radiates all most, all possible range of frequencies in space, including Radio frequencies (RF). In this article, we tried to put all possible and simplified instrumentation to make a Radio Telescope (RT), which is able to trace sun like warm object in space and act as satellite tracer too. This kind of radio telescope is useful for initial phase of study and observation of RF radiating astronomical objects. It will help to learn fundamentals of radio astronomy with low investment.

Key words: Radio Frequency, Radio Telescope, Telescope Instrumentation,

I. INTRODUCTION

When we talk about the astronomy and space research most often we visualize the images of stars, planets and about their capturing devices that is optical telescope, which are the part of visual range frequency observation. However, most of the Astronomical bodies emits visual, radio frequency and x-rays too depends on temperature and surface of the object. This provides a wide space for Radio Astronomy (RA) in league of astronomical observation. In this article, we are presenting simple techniques to make a simple and low cost solar radio telescope with high efficiency. This will be good aid for amateur radio astronomer as well as observation of initial phase radioactivity. We are able to make radio telescope using the materials available in normal electronic and electrical shops nearby. Using such type of homemade telescope we are able to trace many objects in space depends on their temperature and frequencies, which includes natural objects like Sun and manmade objects like satellites. This device will provide a good learning experience for very young researcher of school and college level for demonstration of basic principle of radio astronomy.

II. RADIO TELESCOPE DESIGN

The Radio astronomy founded to study the heavens by observing and analysing the RF energy that emitted by astronomical bodies, as optical astronomers use light energy collected by telescopes. Radio telescopes are enormous in size because of radio wavelength are longer than the visible one. Such enormous size makes it non-affordable and another constrain is the space require for it. The basic technology behind radio telescopes and instrumentation is quite simple; it requires some cheap equipment and simple tools. The construction is quite easy to build a simple and functional radio telescope one of your own. In this technical paper, we assembled simple steps to construct a Radio Telescope.

First, we need to buy some material for constructing an RT. Most of the material is available to you in nearby Market and the list is as follows,

- 1) A satellite receiver dish (the satellite dish focuses the transmissions from the satellite onto the receiver and we are able to watch Tele Vision (TV). In an RT satellite dish, serve the same purpose.)
- 2) A low noise block down converter/LNB (the LNB receives and amplifies the signal, remove unwanted frequencies and converts the signal to a lower frequency in both TV and RT)
- 3) Satellite signal meter (gives the information about signal strength received at LNB)
- 4) Coaxial cable (3 to 5 meter).
- 5) BNC (Bayonet Neill-Concelman) connectors to connect the coaxial cable.
- 6) A power source.

That is all we need to design a Radio Telescope. Images shown in Fig.1 (reference online shopping options)



Fig. 1: Material required for constructing Radio Telescope mostly available on e-markets.

We need to go through the following steps to make a portable and efficient RT, by fitting and plugging the collected material,

- 1) Fit the low noise block down converter/LNB on the arm of the antenna.
- 2) Takes two small pieces of coaxial cable and attach a BNC connector to each end of one piece of cable, and to one end of the other cable.
- 3) Take the coaxial cable with two connectors and plug one end into the LNB and the other into the socket labelled 'LNB/satellite' on the satellite signal meter.
- 4) Plug the connector on second coaxial cable into the satellite meter's second socket (i.e. power or receiver).
- 5) Connect the other end of the cable (i.e. woven copper shield) to the battery's negative terminal and the car to the battery's positive terminal.

We are done with one light and mobile radio telescope, which is easy to carry and handle too.

III. DISCUSSION

Demonstration Capability of this RT is limited. Such a small telescope is not sufficient to detect the distant stars; we can use it to demonstrate to our students that the Sun and other nearby objects in space radiate visible light as well as radio waves. The Sun emits radiation across much of the electromagnetic spectrum. So that, point it by our RT and then point empty sky by our RT, the difference will provide information about Sun. On cloudy days, you are able to locate sun by this technique. Every object emits the RF; using our RT, we are able to detect these objects.

Most of the object emits RF when their temperature is high, so that using RT we are able to detect sources of heat. Since we used TV dish receiver in our RT, therefore we are able to detect the spacecraft too. We are able to locate different satellites using our RT.

IV. CONCLUSION

Radio Frequency almost emitted by every hot object in nature. Wavelength of RF is higher than the visible light; therefore, we need big setup of Radio Telescope to observe the RF. Nevertheless, such kind of small RT is easy to design, operate and portable too. We are able to use this to educate young students in the field of Radio Astronomy. This RT is capable of detecting the location of satellites and heat sources too.

REFERENCES

- [1] Berry, Richard. "Build your own telescope." New York: Scribner, c1985. 1 (1985).
- [2] Hey, James Stanley, and J. S. Hey. The evolution of radio astronomy. Vol. 1. New York: Science History Publications, 1973.
- [3] Spencer, Mark. "Build a Homebrew Radio Telescope-Listen to some real DX with your own listening device." QST 93.6 (2009): 41.
- [4] Prashant, Singh. "Telescope Making for Amateur Astronomer". Vol. 4, No. I (2015), pp. 1-3, Corona Publication.
- [5] Joshi, Bhal Chandra. "Teaching radio astronomy with Affordable Small Radio Telescope (ASRT)." 40th COSPAR Scientific Assembly. Held 2-10 August 2014, in Moscow, Russia, Abstract PE. 2-10-14.. Vol. 40. 2014.