Affoscope Instructions

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Contents

1 Introduction

AffoScope, is the shortform for an affordable telescope. It is a telescope which can deliver a decent performance (nice views of planets and moon), but can be setup on a minimal budget. This write up describes how to make your own AffoScope. For the tech saavy, this is a brief description about a DIY 60 mm refractor (f/11.6) telescope. It is anticipated that this write up will enable all those who are interested in building a (starter) telescope themselves.

The main components of the telescope are

- Objective Lens
- Eyepiece
- Focuser
- Tube
- Stand

How each of the components maybe build, is described below.

Figure 1: Telescope with stand.

2 Objective

This is the lens which gathers light from the object we want to observe. In a telescope, we usually use a lens with a large focal length (several tens of centimeters), to enable sufficient magnification of the observed object. To deal with chromatic aberration, we need to use an achromat which is combination of lenses (which usually is cemented together).

In the affoscope, a commercial 62 mm diameter, 700 mm focal length achromat was used. It is housed in a standard 2 inch PVC plumbing component called 'coupling'.

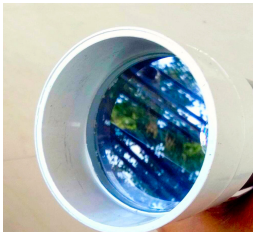

Figure 2: Objective lens in housing.

3 Eyepiece

This is the lens through which the observer sees the object being viewed. Eyepieces are usually made up of several lenses and can be procured as a single piece, which can be inserted into the telescope tube, while using it. The focal length will be very small (10 mm, 25 mm etc.).

In the affoscope a commercial 25 mm eyepiece was used. It is housed in a standard 1 inch PVC plumbing component called 'male threaded assembly (*MTA*). The threaded assembly allows careful adjustment of the focus. The MTA is screwed into a 'female threaded assembly' (*FTA*) attached to the 1 inch diameter tube.

Figure 3: Eyepiece in FTA.

4 Focuser

In order for the observer to see the object (which is usually far far away), the image formed by objective has to fall in the object plane (focus) of the eyepiece. In order for this to be facilitated well, we

need to have a mechanism (called as *focuser*) with which the separation (length) between objective and eyepiece can be carefully adjusted. This is done, by looking through the eyepiece. Ready made focusers are available in the market.

In the affoscope a home made focuser was used. As described above, this is done by using a MTA and FTA. THe eyepiece is kept inside the MTA. The threaded assembly allows careful adjustment of the focus.

Figure 4: Focuser.

Figure 5: Optical tube assembly.

5 Optical Tube Assembly

In a standard refractor telescope both the objective and eyepiece have to be aligned in a single axis. This is done by inserting the components in tubes and arranging the tubes in a concentric manner. This can easily be achieved by choosing standard PVC pipes of suitable diameter, so that the optical components can be housed inside the pipes (or related pipe fittings).

In the affoscope a standard 2 inch PVC tube (65 cm, long) and a 1.5 inch tube (10 cm long) were used, to construct the optical tube assembly (OTA). A standard reducer (2 inch to 1.5 inch) was used to connect the pipes. The PVC pipes are painted in black to avoid reflections.

6 Stand

In order to view celestial objects, we need to have a solid sturdy stand, with the possibility to orient the telescope to the target object easily. Ready to use stands for OTA are available, commercially.

In the affoscope, a low cost design was used. The main component is a GI pipe (one can use a rather rigid PVC pipe as well). Rotation of the stand in the azimuth direction is made possible with a flange and FTA (diameter, determined by that of the pipe) fixed on the base plate (a slightly heavy wooden square). Rotation in altitude direction is made possible by a 'cradle assembly' for 2 inch pipe (OTA diameter) and FTA. The stand is made in a L shape and is oriented vertically.

7 What can be viewed

A standard 60 mm refractor can be used for viewing of many planets as well as moon. With the current telescope, at the time of writing, we could only view moon. A snap of it is included below. As the shot was made with a mobile phone, the image is a bit blurred. Still craters can be seen around the periph-

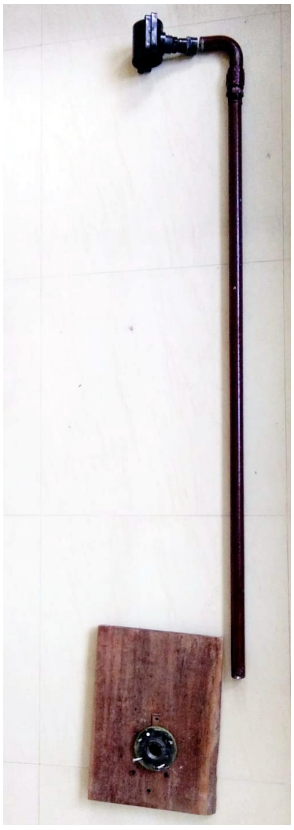

Figure 6: Stand components, kept lying on the floor.

Figure 7: Moon, shot with a handheld mobile phone.

ery of the image, which shows the quality of views possible with the telescope. Also, chromatic aberration is not to be seen.

8 Components

Components for OTA:

1. Objective lens - 62mm dia (achromat)
2. Eyepieces - 25mm 8mm
3. PVC pipe - 60mm dia of length 65 cm
4. PVC pipe - 32mm dia of length 15cm
5. PVC Reducer - 63 x 32
6. PVC Connector - 63mm dia

Components for stand:

1. GI pipe - 32 mm dia, 1.5 m long
2. Elbow with threading - 32mm dia
3. Cradle - 60mm
4. Flange - 1 inch
5. Wooden base with weight

9 Concluding remarks

This write up is made, hoping that many will be benefitted.

A big thanks to Ashalakshmi K V, who built the telescope, described here. The design given here is a slightly modified version of that described by IUCAA and https://astronomyhints.braintidbits.com.

If any of the readers need any guidance in assembling an affoscope, feel free to contact us.