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The 130 cm telescope at Devasthal

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Abstract. The 130 cm telescope at Devasthal, Nainital is operational since 2010. In this article, we will be discussing its specification and operation details.

Keywords : Telescope:, Methods: Observations, Instrumentation:

1. Introduction

The 130 cm diameter optical telescope has been installed in December 2010 at Devasthal (lat=79°41′04″ E; long= 29°21′40″N; Alt = 2420 mtr), Nainital in the central Himalayan region. The main objective for setting up of a 130 cm optical telescope at Devasthal was to meet the observational requirements for the institute's scientific programs, which were so far being carried out using nearly 40 year old 104-cm Sampurnanand telescope. The institute's main scientific programs such as monitoring of transients (Gamma Ray Bursts; GRB, Supernovae explosions), variability of stars in the Milky-way and of active nucleus in external galaxies require an automated telescope for efficient observations. Other programs such as imaging of star clusters require wide field imaging capabilities. The installed 130-cm telescope at Devasthal is able to fulfill most of the these requirements.

2. Specification

The telescope has been fabricated by DFM Engineering Inc. USA. The telescope uses a modified Ritchey-Chretien Cassegrain design and the focal length to diameter ratio (focal-ratio) of the overall optics was kept at 4 making it a very fast system providing 40 arcsec view of the sky in 1 mm scale at the focal plane. A single element corrector provides a nearly flat field view of the sky up to 66 arcmin in diameter. The tube of the 130-cm telescope is of open truss allowing the telescope to cool faster in the ambient. The telescope mount is of fork-equatorial type. The telescope can be pointed to a celestial object with an accuracy of 10 arcsec rms. The mechanical system provides a tracking accuracy at nearly 0.5 arcsec rms over 300 second without any external guider. The images obtained with the telescope show best FWHM at nearly 1 arcsec. The atmospheric extinction at Devasthal is measured as 0.24 mag in B (Blue), 0.14

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Figure 1. The 130 cm Telescope

mag in V (Visual), and 0.08 mag in R (Red) band on the first week of December, 2010. The sky brightness is measured as 21.2 mag/arcsec^2 in the V band in moonless night.

3. Available Back-end Instruments

Three CCD cameras along with Broad-band (UBVRI), (u,g,r,i,z) and narrow band interference filters for O[III], S[II], and H-alpha line are currently available with the telescope for obtaining images of the celestial objects. The cameras are: (1) 2048x2048 pixels, 13.5 micron pixel size conventional back-illuminated, deep thermoelectrically cooled (-80 degree centigrade) CCD being used for deep and wide field observations, (2) 512x512 pixels, 16 micron pixel size electron multiplying frame transfer back-illuminated, deep thermoelectrically cooled (-90 degree centigrade) CCD for time series fast photometric observations, (3) 3326x2504 pixels, 5.4 micron, front illuminated, thermoelectrically cooled (-30 degree centigrade) conventional CCD used for auto-guiding. The first two cameras use high quantum efficiency E2V chip, assembled by ANDOR with low read noise electronics. The third camera is from SBIG using Kodak chip. The observing time for the telescope can be obtained by applying through ARIES JTAC, http://aries.res.in/ 40inch/104cm/, three times a year for the cycles: Jan- March, April-June, Oct-Dec. All the informations regarding the telescope, observing procedures and cameras can be obtained through the link: http://aries.res.in/ 1.3m/ariesmain.html. The observation are done through the observatory control system by operating the filters, cameras and telescope remotely. We have a online automatic weather station and all sky monitoring camera to know about the present sky conditions at Devasthal. Observing log and data archive of the observations are also maintained online at 130 cm telescope web-page.

4. Results from 130 cm telescope observations

The telescope is operational since the season of 2010-2011. Observations of supernovae, GRBs, Quasars, AGN, star clusters has been taken. Till now, around 28 papers including seven GCNs have been published using the data taken from 130 cm telescope in major astronomical journals. The list of publication is maintained at: http://aries.res.in/ 1.3m/publication/publication.php.