
Scientific Programmes with India's National Large Solar Telescope and their contribution to Prominence Research

S Sirajul Hasan^{*1}

¹Indian Institute of Astrophysics – Koramangala Bangalore 560034, India

Abstract

India's National Large Solar Telescope (NLST) is a state-of-the-art 2-m class telescope for carrying out high-resolution studies of the solar atmosphere. Its geographical location in the Ladakh region of Jammu & Kashmir (India) will fill the longitudinal gap between Japan and Europe and is expected to be the largest solar telescope till ATST and EST come into operation. NLST is an on-axis alt-azimuth Gregorian multi-purpose open telescope with the provision of carrying out night time stellar observations using a spectrograph at the Nasmyth focus. The telescope utilizes an innovative design with low number of reflections to achieve a high throughput and low polarization. High order adaptive optics is integrated into the design that works with a modest Frieds parameter of 7-cm to give diffraction limited performance. The post-focus instruments include broad band and tunable Fabry-Perot narrow band imaging instruments, a high resolution spectropolarimeter and an echelle spectrograph for night time astronomy.

NLST will address a large number of scientific questions with a focus on high resolution observations. The direct measurements of magnetic fields in prominences have so far been obtained mainly in H-alpha, He I multiples at the visible and IR wavelength regions. However, they achieve a spatial resolution of few arc sec. With NLST, high spatial resolution observations of prominences are possible in these spectral lines using multi-line spectropolarimetry. Studies of filament eruptions as a whole, and the dynamics of filaments on fine scales using high resolution observations will be undertaken. An important issue is to examine the role of barbs that undergo appearance and disappearance in the activated phase of an eruptive filament.

NLST will carry out observations to examine the following aspects related to prominences:

- (1) Morphology of different prominences and their association to the magnetic field structure;
- (2) Magnetic field structure of different barbs and how they are connected to the underlying photospheric magnetic field;
- (3) Magnetic helicity in the solar prominences and filaments;
- (4) Formation of prominence/filament plasma and how does it evolve along with its magnetic field configuration;
- (5) Prominence/filament oscillation and its relation to the MHD waves and possible heating mechanisms;

^{*}Speaker

(6) Magnetic structure of polar crown prominences.

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