

FE analysis for the mechanical structure of Prototype Segmented Mirror Telescope

Abstract:

To keep in pace with the emerging trends in scientific research and cater to the need of growing Indian astronomical community, a need is strongly felt for realising an 8-10 meter size optical telescope in India. Construction of such a large optical telescope size is possible only when the primary mirror is made of large number of small mirror segments. In segmented mirror technology, smaller mirror segments are aligned with respect to each other so that it acts like a single, monolithic large aperture telescope.

Before embarking on such a large and expensive segmented mirror telescope project, it is necessary to understand the complexities of the segmented mirror technology by thoroughly working on the design, development, analysis, fabrication, realisation and laboratory experimentation by making a full-fledged prototype segmented mirror telescope (PSMT) of a smaller size. It is planned to realise a 1.5m aperture PSMT at IIA, with 7 segments for this purpose. The design and analysis of this PSMT is in advanced stage.

Detailed structural and thermal analysis has been carried out for different configurations of the telescope to evaluate the stresses, deformation, stiffness/natural frequencies, reaction forces and moments due to gravity, wind load and temperature variations for static, dynamic and transient cases. Some details of these analysis are presented in this paper.

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