

Study of performance of segment support assembly for NLOT/MSE primary mirror segments

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 class optical telescope in India. Construction of such a large size optical telescope 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 to match with the ROC so that it acts like a single, monolithic large aperture telescope. Before embarking on such a large and expensive segmented mirror telescope project, we tried the mechanical design adaptability of already existing similar class telescope's segment support assembly (SSA) whose primary mirror segments size remains same but of varying ROC. Finite element analysis is carried out for the primary mirror segments of similar size but of varying ROC supported with identical SSA with similar loading and boundary conditions to compare the structural and thermal analysis results to verify the deviation in results among them and to check whether the same existing SSA could be used to support NLOT/MSE primary mirror array with minimal design modifications and tweaking the actuator mechanism.

Detailed structural and thermal analysis has been carried out for the primary mirror segments array supported with SSA at various levels 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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