

Design and development of mechanical systems of SUIT Payload onboard Aditya L1.

The Solar ultraviolet imaging telescope (SUIT) onboard Aditya L1 is an upcoming space telescope to study the Sun in near UV (200nm - 400nm) range and will be placed in a halo orbit around Sun-Earth L1 point. The mechanical systems design of SUIT involved considering crucial factors of structural integrity to withstand launch loads, meeting temperature specifications within the payload, light-weighting of components, assembly and alignment sequence to meet the optical requirements.

The instrument can reach high temperatures due to exposure to 1450W/m² solar intensity at L1, while the CCD imaging device will need to operate at a temperature of -55 degrees Celsius. Moreover, the payload components include moving mechanisms, optics, and electronics, which have specific vibration qualification values. Therefore, the design of the mechanical housing for these items needs to ensure that the thermal deformation is within allowed limits and the components will survive launch loads.

In the presentation, we will be discussing the procedure to develop the mechanical design of the instrument and the various techniques used to validate the design. We used the design software Solidworks and NX Nastran for the CAD modeling and FEM studies for designing these components. This included features such as grid structures, thin-walled structures, honeycomb panels, flexures based mounts, to meet the final optical, structural and thermal specifications. The presentation will include the methods and results of thermal distortion studies, vibration simulation studies, and a brief report on manufacturability, optomechanical assembly procedure of the instrument so as to meet the design requirements.

The overall impact of this study is that it can be an additional guideline for facilitating the mechanical systems design of space telescopes and will be useful in similar future projects.