



The Moveable Structure of the Dome for the Largest Solar Telescope (DKIST)

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Abstract

The Daniel K. Inouye Solar Telescope (DKIST), formerly the Advanced Technology Solar Telescope (ATST), is a solar telescope currently under construction at the Haleakalā High Altitude Observatory Site in Maui, Hawai'i. When completed, it will be the largest solar telescope in the world, with unprecedented abilities to view details of the Sun.

The DKIST dome is the large moveable structure about 26m in diameter and 22m high, which protects the telescope and its instrumentation. During the observation, it rotates together with telescope and positions by means of a large moveable shutter the aperture through which the telescope observes with millimetric accuracy, protecting the telescope and its delicate instrumentation from the wind shaking and the solar radiation.

The proposed design is based on a multi-sector shutter system arrangement with an innovative crawler drive system (IDOM patent) assembled on two steel fabricated arch girders. These arch girders supported on a steel fabricated base ring and stiffened by a set of vertical and horizontal steel trusses, the secondary structure. Beneath the base ring a set of bogies with steel wheels allows the rotation of the whole structure.

This structure has been designed and optimized so as to ensure the appropriate mechanism-structure interaction and to withstand the Minimum Design Loads for Buildings and Other Structures as defined by ASCE 7-05 for the Site. The latter has become a significant design driver as Hawaii is both a hurricane prone area and a seismic active region.

This paper describes the design proposed by IDOM for this mechanism and how it has been implemented through the different phases of the Project: Design, Fabrication, Factory Assembly and Testing, Packaging and Transport and Site Assembly and Testing.

Keywords: DKIST, ATST, telescope, enclosure, dome, shutter, moveable, retractable, crawler, mechanism