CADFEM Consulting

Stiffness Analysis for a Large Telescope

Ensuring Reliability of Optical Instruments

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Task

GALACSI is an adaptive optic system housing several wave front sensor cameras, relay optics, electronics and required mechanical systems. The complete structure is mounted to one of the VLT Telescopes of the Paranal Observatory in Chile.

Flexures of the optical system (mirrors/lenses) due to environmental conditions (gravity, earthquake, temperature changes) may deteriorate the performance of the system significantly.

Aiming to ensure the reliability of the sensitive structure GALACSI's stiffness behavior was determined using ANSYS® Workbench™.

Solution

A finite element model of the support structure based on solid elements was created. Optical components or sub systems were idealized at the position of their optical points using point-masses attached to the respective mounting locations. Third parties' components (e.g. drives) were simplified using their data sheet's stiffness values.

Flexures and frequencies were calculated for various configurations possible. The optical point displacements and rotations were exported with respect to optical path's alignments.
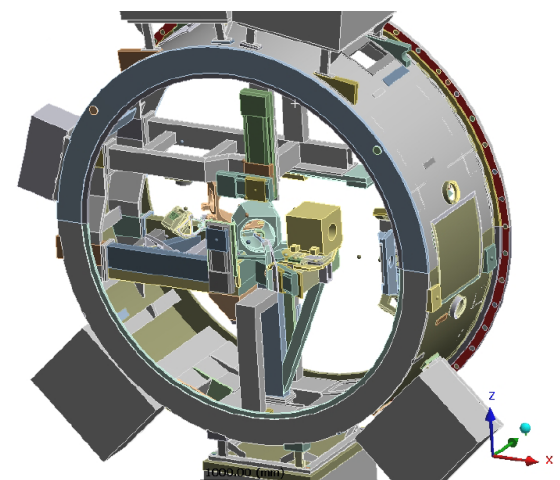
Benefit for the customer

By means of these results and the customer's sensitivity matrix the image stability of the system has been evaluated by the customer.
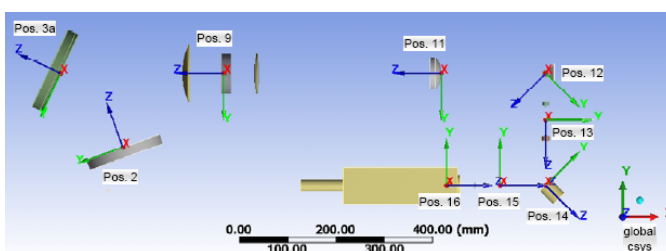
Introducing the required optical coordinate systems in the FE environment allows an efficient postprocessing of the system's behaviour.
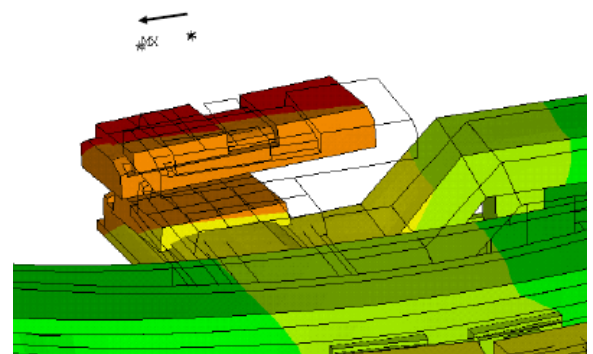

Very large Telescope

GALACSI Module

Light path with optical points & coordinate systems.

Displacement of a selected optical point

Figures Courtesy of European Organisation for Astronomical Research (ESO), Garching

ANSYS Competence Center FEM

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