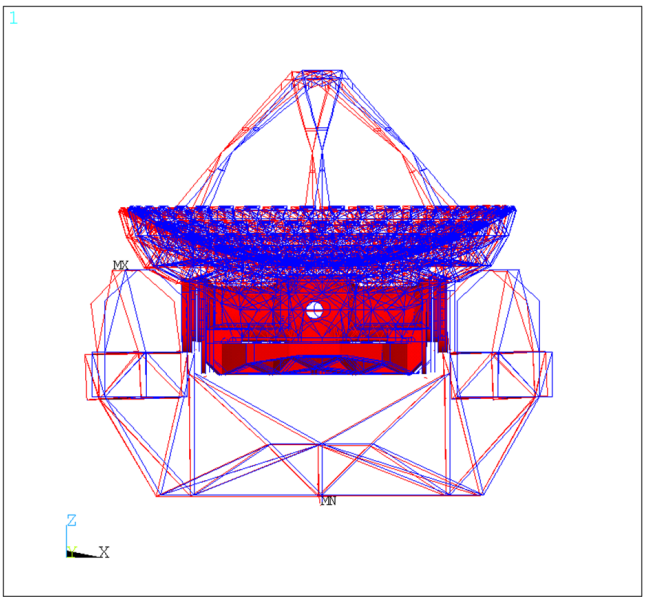
CERRO CHAJNANTOR ATACAMA TELESCOPE (CCAT)

By *ANSYS Advantage* Staff

CCAT is a planned 25-meter telescope for studying galaxy formation and evolution through the history of the universe, the hot gas pervading clusters of galaxies, and other phenomena. The telescope will combine high sensitivity, a wide field of view and broad wavelength range to provide an unprecedented capability for deep, large-area multicolor submillimeter surveys. CCAT was ranked the highest priority among medium-scale ground-based projects by the National Research Council, which recommends priorities for astronomy projects. It was designed by a consortium of university research teams, including one from Cornell.

"One of the greatest challenges the Cornell team faced in the project was to understand how a large structure, tens of meters in each dimension, behaves at the micron level to maintain the accuracy of the mirror surface and pointing," says Jeff Zolkower, systems engineer for the CCAT project. The Cornell team modeled each telescope subsystem with a detailed ANSYS Mechanical finite element model that provided estimates of gravitational and thermal deformation. A simplified finite element model of the complete structure was used to estimate the overall deformation of the telescope. FEA determined the natural frequency of the structure and was used to estimate the scan deflection, gravitational deflection and thermal deformation. Pointing errors were estimated using a reduced-order FEM and a MATLAB control model. These and other analysis results were combined to predict the overall performance for the telescope.



Modal analysis of telescope, 4th mode

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Learning Experience

ANSYS and Cornell University have developed a unique collaboration that has flourished for well over a decade, helping to extend Cornell's reputation as one of the world's leading research institutions. ANSYS software is used by students and teachers in the classroom as well as project teams and researchers to solve challenging mechanical and fluid- flow problems.

References

Woody, D.; Padin, S.; Chauvin, E.; Clavel, B.; Cortes, G.; Kissil, A.; Lou, J.; Rasmussen, P.; Redding, D.; Zolkower, J. The CCAT 25m-Diameter Submillimeter-Wave Telescope. *Proceedings SPIE*, **2012**, Vol. 84442M.

Telescope Design Summary, CCT-TM-120, **2013**.