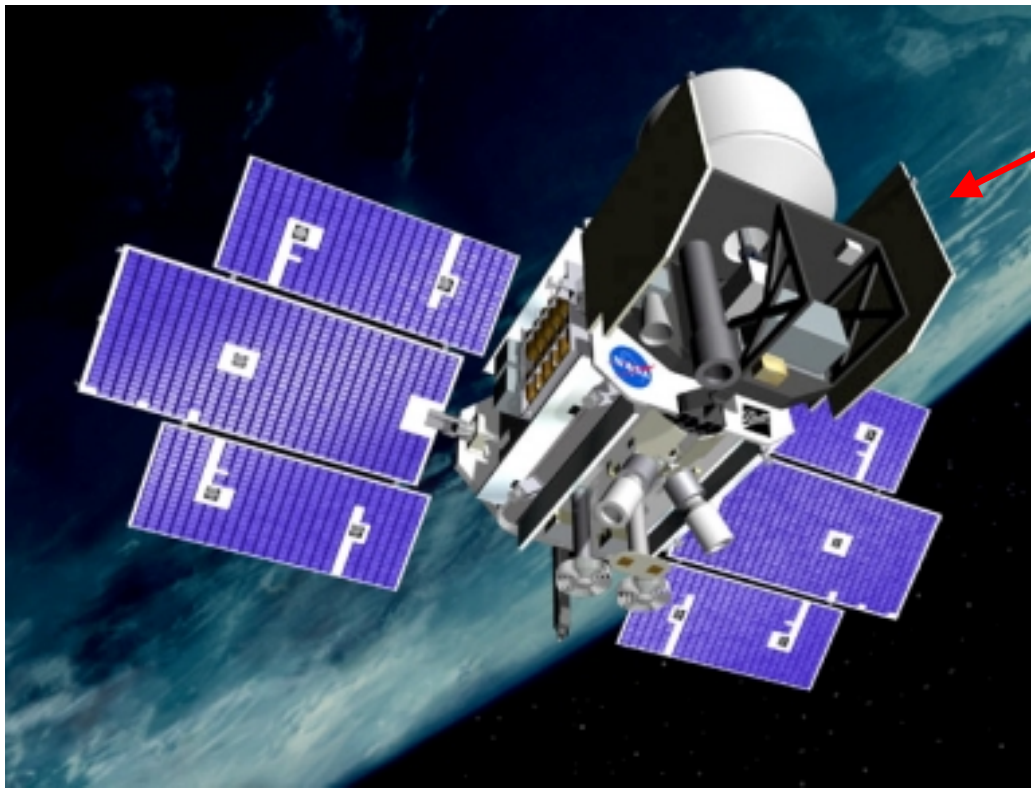
GLAS Instrument
(Geoscience Laser Altimeter System)

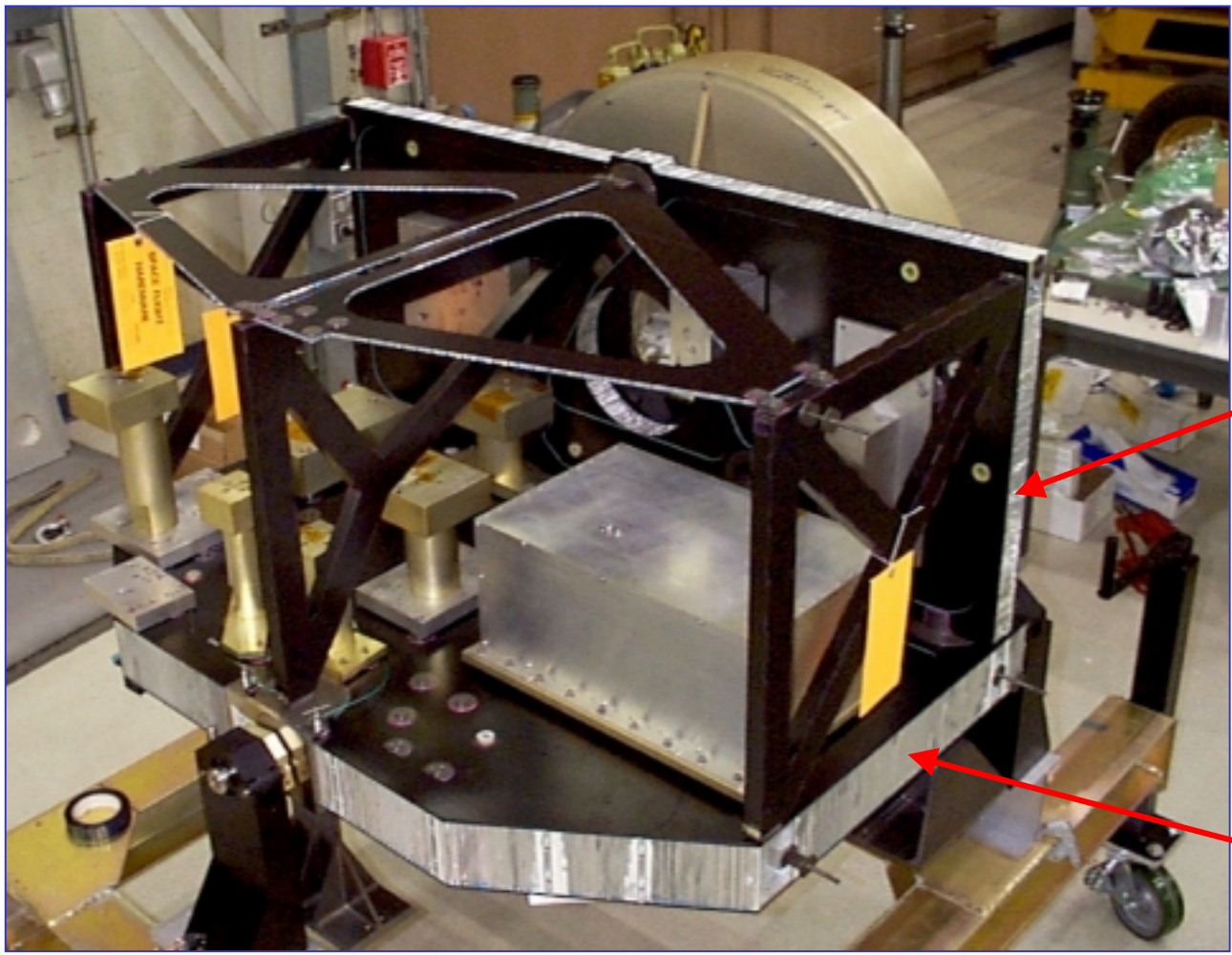


GLAS Instrument
(ICESat Spacecraft)

- Measures polar ice-sheet topography and temporal changes in topography; cloud heights, planetary boundary heights, and aerosol vertical structure; and land and water topography

Picture Courtesy of Ball Aerospace

GLAS Instrument Structure w/ Mass Simulators



Telescope Bench

2” Honeycomb Core

0.06” Composite Facesheets

Optical Bench

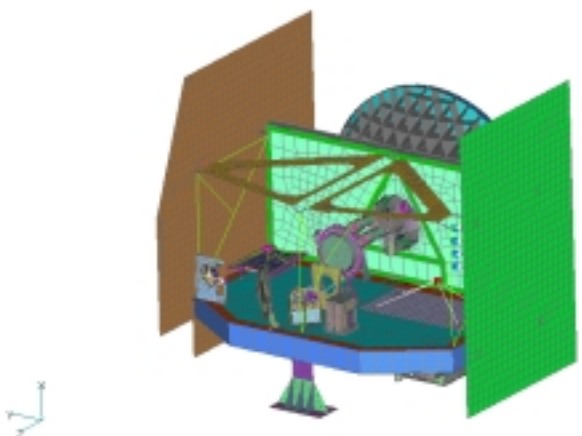
4” Honeycomb Core

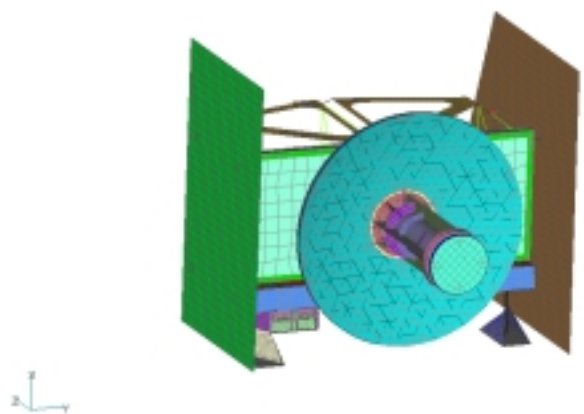
0.08” Composite Facesheets

STOP Analysis
(Structural-Thermal-OPtical)

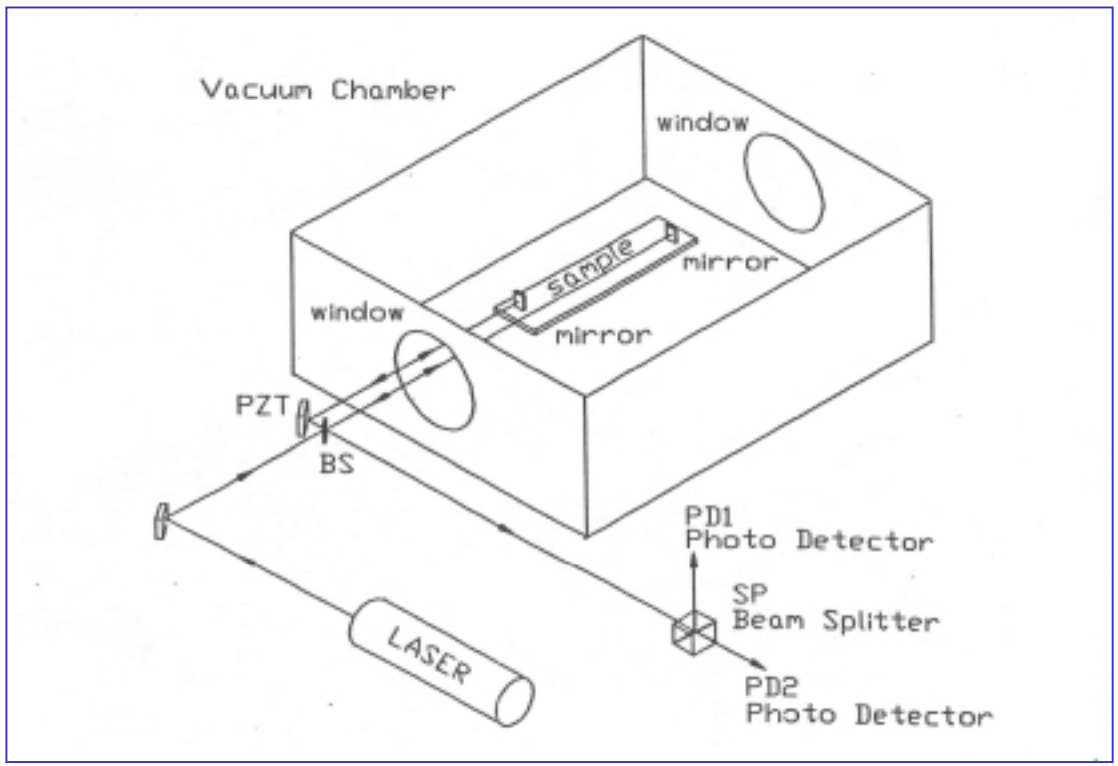
- Used to predict optical performance of a system degraded by thermal distortions
- NASTRAN used to predict motion and deformation of optical components

Accurate Material Thermal Properties Required for STOP Analysis





Laser Interferometer Used to Measure GLAS Bench CTE



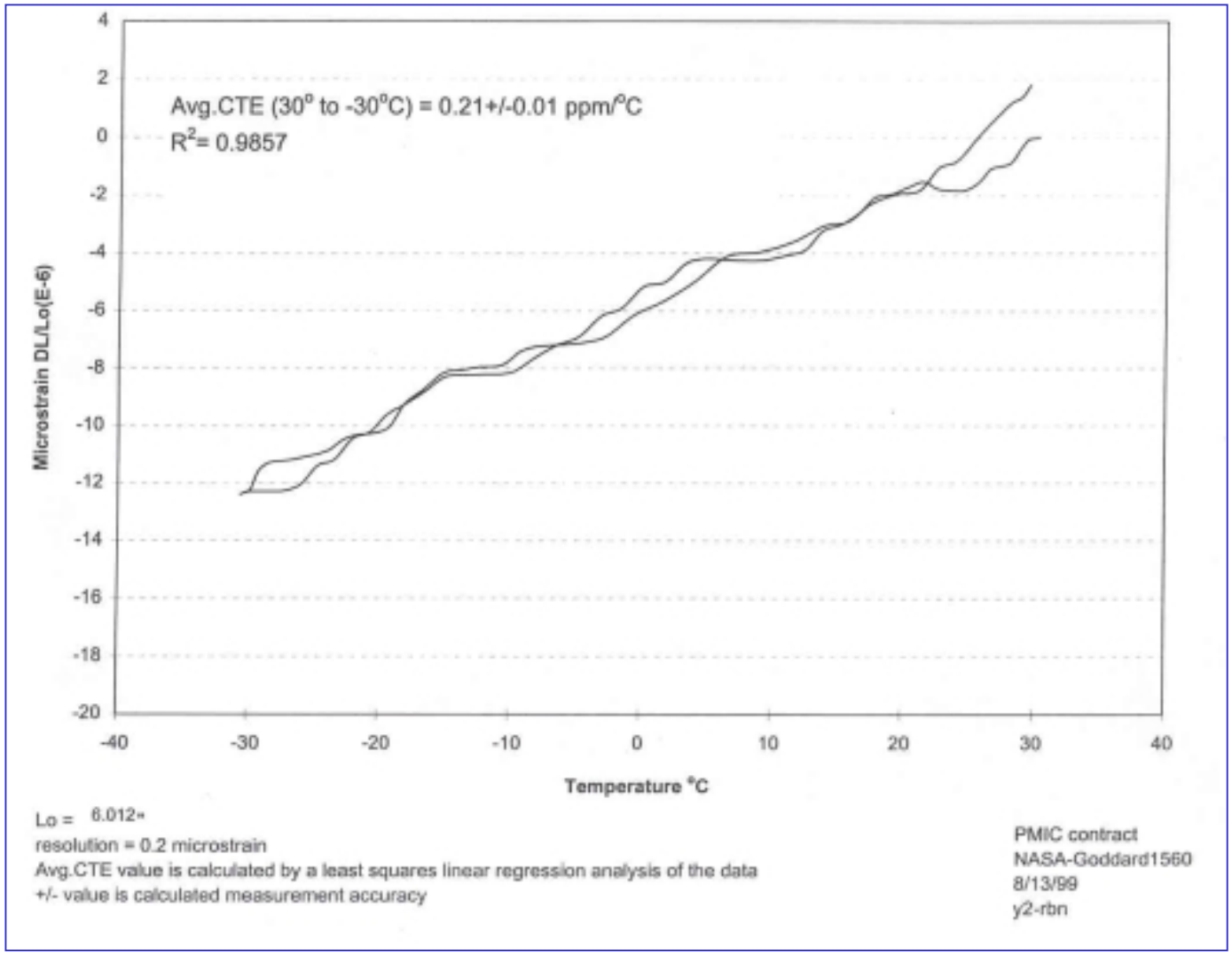
- Laser Interferometer suitable for real time displacement of components with CTE values as low as 10^{-9} /K
- Temperature can be accurately cycled over wide range
- 8” x 8” Samples

Information Provided By Precision Measurements and Instruments Corporation (PMIC)

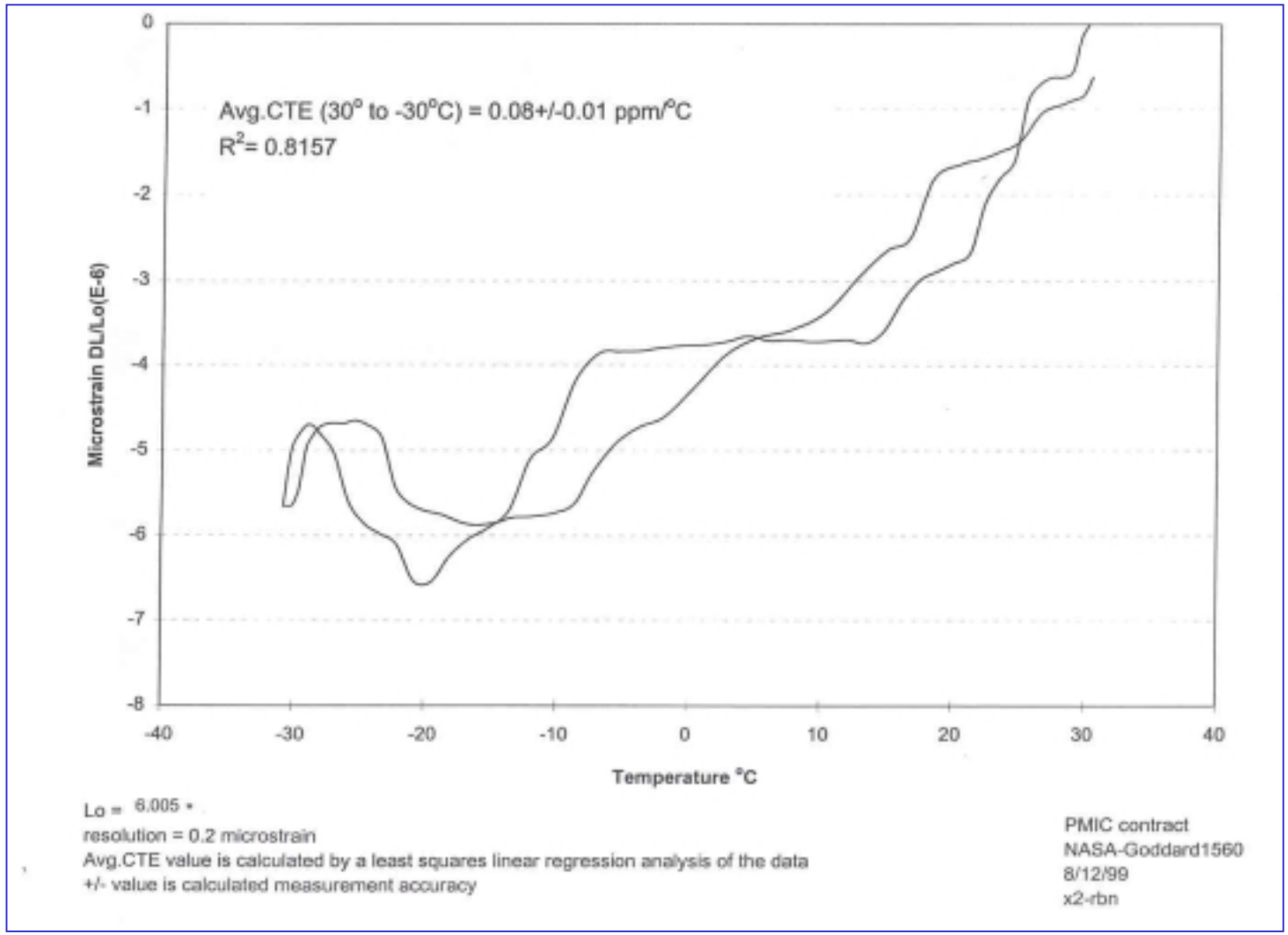
Michelson Laser Interferometer

- Helium-neon laser provides stable frequency beam
- Laser is split by beam splitter (BS)
- First beam is reflected off mirror PZT and passes into vacuum chamber
- Second beam passes though BS and enters vacuum chamber
- Beams are reflected off sample mounted mirrors and return along their respective paths and interfere, forming a fringe pattern
- Beam splitter SP separates finge pattern light and directs them to photo-detectors PD1 and PD2
- Each shift in the fringe pattern corresponds to a change in sample length equal to 1/2 the wavelength of the laser light (12.456 μin)

Optical Bench Thermal Expansion in Ribbon Direction



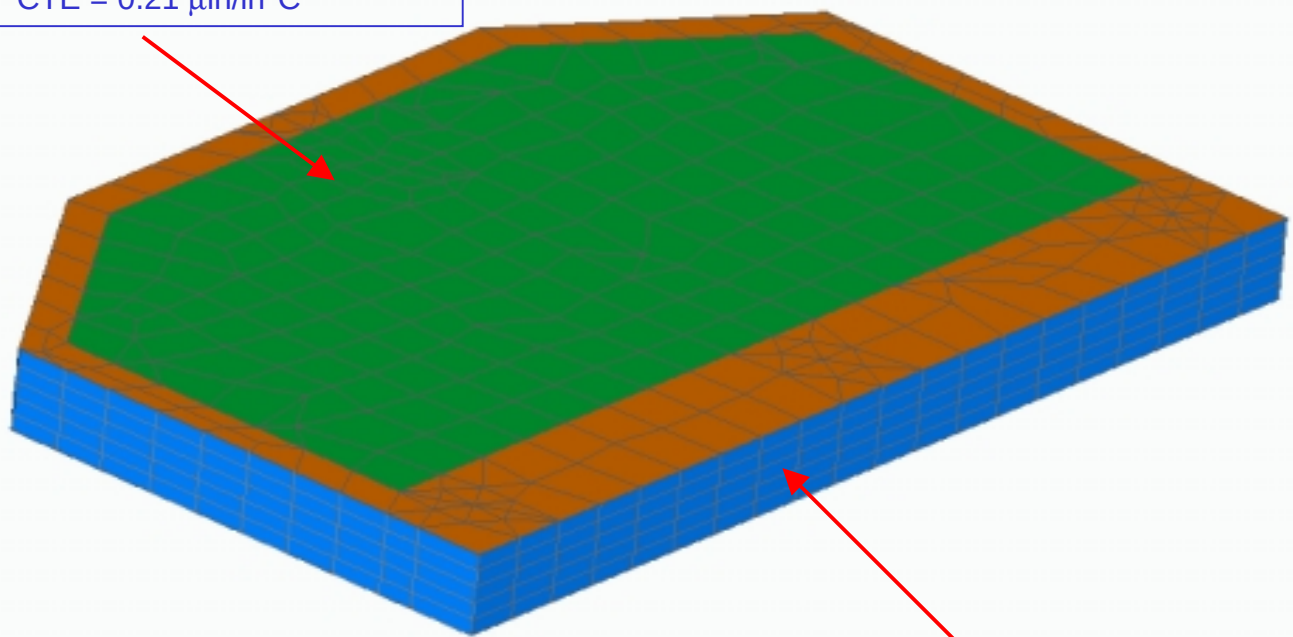
Optical Bench Thermal Expansion in Cross-Ribbon Direction



GLAS Optical Bench NASTRAN Model

Composite Face Sheet (Plate Element)

CTE = 0.21 µin/in*C



Aluminum Honeycomb Core (Solid Element)

CTE = 0.21 µin/in*C (L and W Directions)