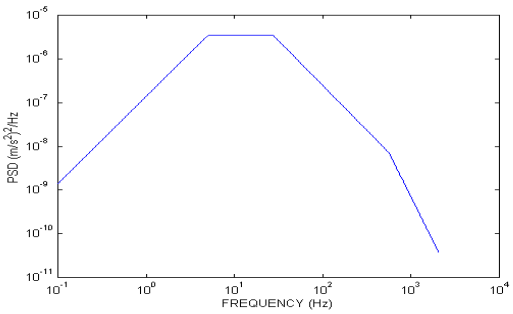
Integrated Modeling & Vibration Analysis
Next Generation Space Telescopes

Problem: Analyze vibration performance of a complex prototype structure using sub-system models provided by multiple contractors.

Integrated Modeling

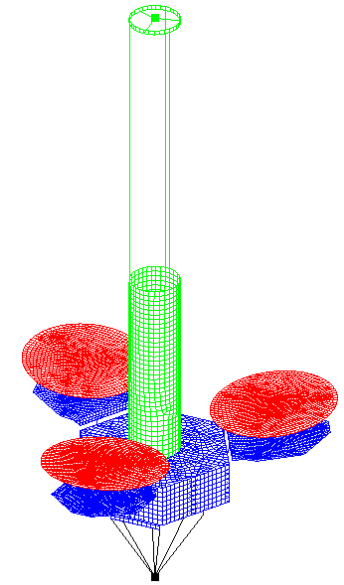
SDL is currently under contract to the U.S. Air Force Research Laboratory (AFRL) to provide integrated modeling and vibration analysis for a prototype deployable space telescope (DST). The figure to the right shows the major DST subsystems in different colors, each being manufactured by different contractors. The integrated modeling effort involves assembling the individual subsystem finite-element models provided by the contractors into a single system-level finite-



Base Excitation Power Spectral Density

PSD Analysis

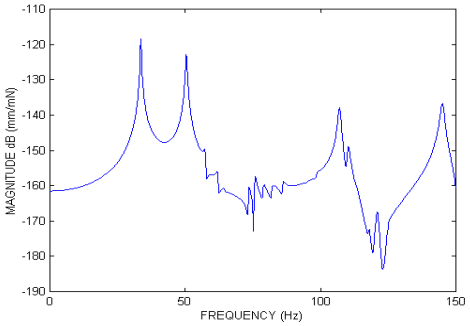
The purpose of the vibration analysis is to verify subsystem as well as system-level performance. Prior to fabrication, this information is used to evaluate subsystem designs, after fabrication, this information will be used to assess the need for modifications during system integration. By using power spectral density (PSD) curves for the disturbances expected during system operation, along with frequency response functions describing the system's input-output behavior, PSD's of important system responses may be computed. The integral of the PSD represents the mean-square value of the corresponding time response.



AFRL Prototype Deployable Space Telescope

Substructuring

SDL uses powerful sub-structuring techniques which enable the merging of modal models obtained from either experimental or finite-element modeling. The use of experimental modal models can significantly increase the fidelity of the overall system model. Sub-structuring also allows easy comparison of subsystem designs.



Typical Frequency Response Function

Solution: Apply sub-structuring and power spectral density analysis techniques to finite-element and experimental models of sub-systems for high-fidelity prediction of overall system performance.

SDL

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