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Two-Stage Passive Vibration Isolator

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The design and testing of a structural system were implemented to hold the optics of the planned Space Interferometry Mission (SIM) at positions and orientations characterized by vibrational translation and rotation errors of no more than a few nanometers or a few milliarcseconds, respectively. Much of the effort was devoted to a test bed for verifying the predicted behavior of a vibration-isolation structural subsystem working together with an active control system for positioning and orienting the SIM optics.

There was considerable emphasis on the vibration-isolation subsystem, which was passive and comprised two stages. The main sources of vibration were six reaction wheels in an assembly denoted the "backpack." The first vibration-isolation stage consisted of hexapod isolator mounts — one for each reaction wheel — characterized by a natural vibration frequency of 10 Hz. The second stage was a set of three beams, disposed between the backpack and the structure that held the SIM optics, that were flexured such that they transmitted only bending loads, with a natural vibrational frequency and damping of about 5 Hz and 4 percent, respectively.