the sample ungripped. This design uses about 8-in. (20-cm) of wire per tests. Multiple tests were conducted at both room and elevated temperature with no failures in the grip region.

The novelty of this wire test fixture lies in its simplicity. Its compact features allow the user to install the fixture in a test frame with little or no modifications. The self-alignment feature designed into set-up places the wire specimen in perfect alignment with the test frame. The loading spools, when gripped, are in direct contact with the test frame water-cooled wedge grips. This helps to draw temperature away from the fixture for ease of high-temperature testing.

This work was done by Christopher S. Burke of Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18579-1.

A Sub-Hertz, Low-Frequency Vibration Isolation Platform

This system can be used for vibration isolation in semiconductor manufacturing, for space-based imaging systems, or fine pointing of free-space optical communication transceivers.

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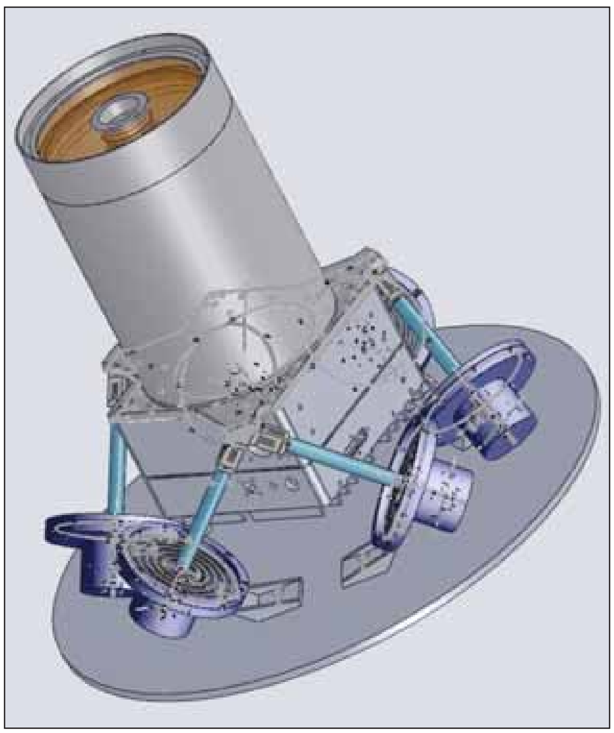
One of the major technical problems deep-space optical communication (DSOC) systems need to solve is the isolation of the optical terminal from vibrations produced by the spacecraft navigational control system and by the moving parts of onboard instruments. Even under these vibration perturbations, the DSOC transceivers (telescopes) need to be pointed l000's of times more accurately than an RF communication system (parabolic antennas).

Mechanical resonators have been extensively used to provide vibration isolation for ground-based, airborne, and space-borne payloads. The effectiveness of these isolation systems is determined mainly by the ability of designing a mechanical oscillator with the lowest possible resonant frequency. The Low-Frequency Vibration Isolation Platform (LFVIP), developed during this effort, aims to reduce the resonant frequency of the mechanical oscillators into the sub-Hertz region in order to maximize the passive isolation afforded by the 40 dB / decade roll-off response of the resonator. The LFVIP also provides tip / tilt functionality for acquisition and tracking of a beacon signal. An active control system is used for platform positioning and for dampening of the mechanical oscillator.



A CAD rendering of the **Low-Frequency Vibration Isolation Platform** with payload. Shown is the configuration of the six LFVIP struts (four shown). One of the lower left struts clearly shows the steel membrane with its topology designed to have a reasonably high stiffness along the membrane plane.

The basic idea in the design of the isolation platform is to use a passive isolation strut with a ≈100-mHz resonance frequency. This will extend the isolation range to lower frequencies. The harmonic oscillator is a second-order low-pass filter for mechanical disturbances. The resonance quality depends on the dissipation mechanisms, which are mainly hysteretic because of the low resonant frequency and the absence of any viscous medium.

The LFVIP system is configured using the well-established Stewart Platform, which consists of a top platform connected to a base with six extensible struts (see figure). The struts are attached to the base and to the platform via universal joints, which permit the extension and contraction of the struts. The struts' ends are connected in pairs to the base and to the platform, forming an octahedron. The six struts provide the vibration isolation due to the properties of mechanical oscillators that behave as second-order low-pass filters for frequencies above the resonance. At high frequency, the ideal second-order low-pass filter response is spoiled by the distributed mass and the internal modes of membrane and of the platform with its payload.

The mechanical oscillator is implemented using a particular geometry of a stainless steel membrane. This geometry provides a very soft mechanical compliance along the axis orthogonal to the membrane and about axes coplanar to the membrane. It also allows the design of a membrane with sufficiently stiff compliances on the other remaining directions.

The proposed LFVIP has the potential to yield a low-power, low-mass isolation system for payloads requiring stable platforms, such as imaging and free-space optical communications.

This work was done by Gerardo G. Ortiz, William H. Farr, and Virginio Sannibale of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov. NPO-46862