much larger set of molecular-structure descriptors by means of principal-component analysis and (2) K_0 values for that compound in two different drift gases.

In a numerical-simulation test of the method, the neural network was trained by use of descriptors, K_0 values, and molecular masses pertaining to 65 organic compounds, then interrogated by use of descriptors and K_0 values pertaining to 10 other organic compounds. The molecular masses generated by the neural network were found to differ from the correct values by root-mean-square errors of no more than a few percent.

This work was done by Tuan Duong and Isik Kanik of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). NPO-44576

Optical Displacement Sensor for Sub-Hertz Applications

NASA's Jet Propulsion Laboratory, Pasadena, California.

A document discusses a sensor made from off-the-shelf electro-optical photodiodes and electronics that achieves 20 nm/(Hz)$^{1/2}$ displacement sensitivity at 1 mHz. This innovation was created using a fiber-coupled laser diode (or Nd:YAG) through a collimator and an aperture as the illumination source. Together with a germanium quad photodiode, the above-mentioned displacement sensor sensitivities have been achieved. This system was designed to aid the Laser Interferometer Space Antenna (LISA) with microthruster tests and to be a backup sensor for monitoring the relative position between a proof mass and a spacecraft for drag-free navigation. The optical displacement sensor can be used to monitor any small displacement from a remote location with minimal invasion on the system.

This work was done by Alexander Abramovici, Meng P. Chiao, and Frank G. Dekens of Caltech for NASA's Jet Propulsion Laboratory. ***For further information, download the Technical Support Package (free white paper) at www.techbriefs.com/tsp under the Physical Sciences category****. NPO-30681*

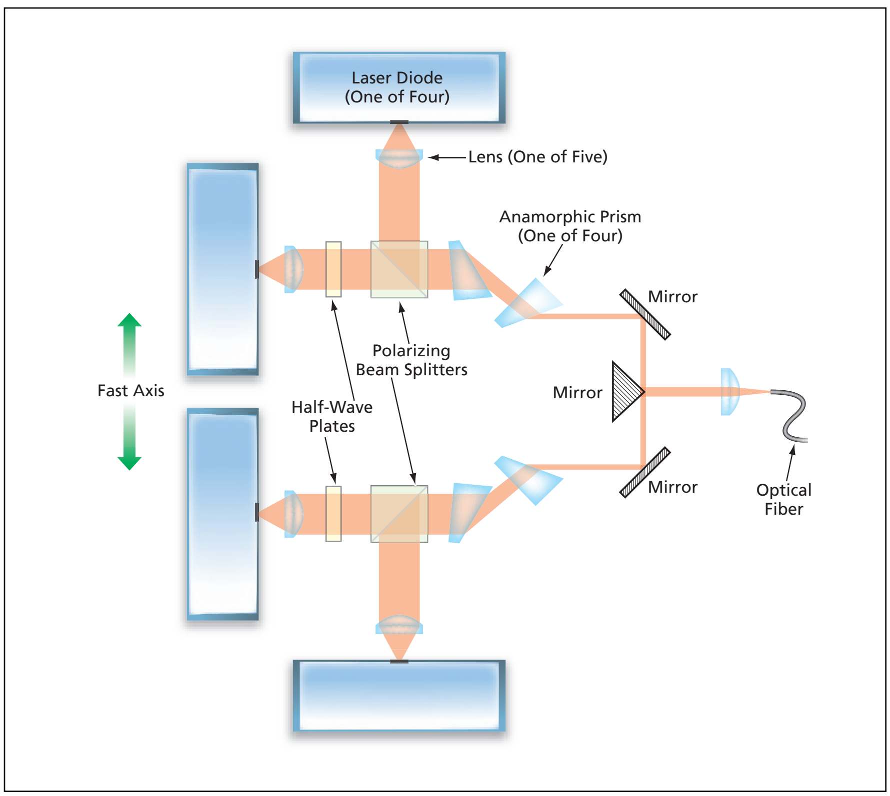
Polarization/Spatial Combining of Laser-Diode Pump Beams

Four beams are combined into two, which are then combined into one.

NASA's Jet Propulsion Laboratory, Pasadena, California

The figure depicts a breadboard version of an optical beam combiner that makes it possible to use the outputs of any or all of four multimode laser diodes to pump a non-planar ring oscillator (NPRO) laser. This apparatus could be an alternative to the one described in the immediately preceding article. Whereas that one utilizes spatial (beam-shaping) beam-combining techniques, this one utilizes a combination of polarization and spatial beam-combining techniques. In both that case and this one, the combined multiple laser-diode pump beams are coupled into an optical fiber for delivery to the NPRO pump optics.

As described in more detail in the immediately preceding article, the output of each laser diode has a single-mode profile in the meridional plane containing an axis denoted the "fast" axis and a narrower multimode profile in the orthogonal meridional plane, which contains an axis denoted the "slow" axis. Also as before, one of the purposes served by the beam-combining optics is to reduce the fast-axis numerical aperture (NA) of the laser-diode output to match the NA of the optical fiber. Along the slow axis, the unmodified laser-diode NA is already well



Four Laser-Diode Beams are polarization-combined into two, then narrowed along the fast axis, then combined into one beam incident on an end face of an optical fiber.