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NASA TECH BRIEF

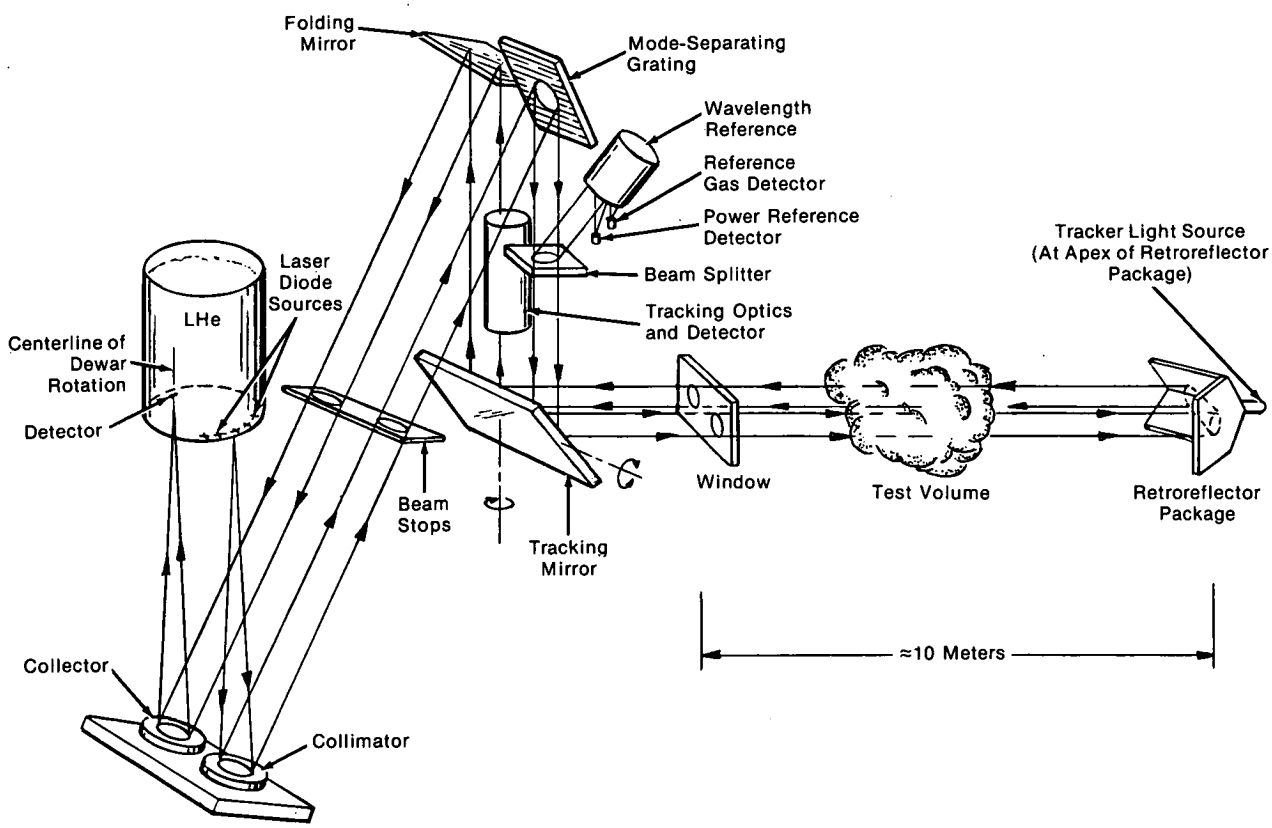
Langley Research Center

Tuneable Diode Laser Spectrometer With Integral Grating

A novel optical arrangement was developed during a design study for an airborne infrared spectrometer using tuneable laser diodes. A grating is used in place of one of the required folding mirrors, and is thus made an integral part of the optical system.

Present tuneable infrared laser diodes emit more than one mode at a time and require, in most cases, rejection of all but one of these modes (usually a few wavenumbers apart) in order to avoid ambiguity. At present this is typically done by a separate monochromator — a relatively bulky item which must be held in rigid alinement to the rest of the system. The arrangement shown in the illustration eliminates the separate monochromator unit and solves the alinement problem by use of a retroreflector. This provides intrinsic compensation against common motion of diode and detector with respect to the rest of the system.

As shown in the figure, the coherent beam from a laser is collimated and transmitted to the retroreflector. The returned beam is then focussed on a detector.



Laser Spectrometer System

(continued overleaf)

The frequency (wavelength) of the beam is swept so that an amplitude modulation results if there is an absorption line in the atmospheric transmission path.

A practical system to fit into existing research aircraft requires a number of folding and steering mirrors in the path of the collimated beam. If one of these is replaced by a grating, the laser diode and the detector, located at the foci of collimator and collector, respectively act as the entrance and exit slits of a monochromator, and the unwanted laser diode modes can be rejected.

Note:

Requests for further information may be directed to:

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Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

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