December 1972

B72-10520

NASA TECH BRIEF

NASA Headquarters

Acousto-Optic Filter for Electronic Laser Tuning

The problem:

A device that provides electronic tuning of lasers to desired frequencies will greatly improve the versatility of laser systems.

The solution:

The suggested device is an electronically tunable acousto-optic filter.

How it's done:

The proposed filter utilizes collinearly acousto-optic diffraction in an optically anisotropic medium. The crystal orientation in the proposed filter is such that an incident optical signal of one polarization is diffracted into the orthogonal polarization by a collinearly propagating acoustic beam.

The filter is an $LiNbO_3$ with a pass band approximately 1.3 cm wide. It is tunable from 400 to 700 nm by changing the acoustic frequency from 428 to 900 MHz, respectively. The angular aperture is 1.5°, and 100% transmittance at the filter frequency should be attained with 14 mW of acoustic power per mm^2 of filter aperture. The filter consists of an input polarizer, a crystal with an appropriate acoustic transducer, and an output polarizer.

To obtain electronic laser tuning, the filter is placed inside the cavity of any laser which has a relatively broad gain versus wavelength characteristic. With the desired wavelength band selected, the filter diffracts this band into the orthogonal polarization. At the crystal output, light in this polarization is refracted at an angle slightly different from that of the original polarization. An output mirror of the laser cavity is then positioned to selectively reflect the light only in the desired frequency band.

Notes:

1. Experiments are being performed on a laser system which uses a 0.473-μm laser pumping source, rhodamine 6g as the organic dye, and calcium molybdate as the acousto-optic crystal.
2. Requests for further information may be directed to:
   Technology Utilization Officer
   NASA Headquarters
   Code KT
   Washington, D.C. 20546
   Reference: B72-10520

Patent status:

Title to this invention has been waived under the provision of the National Aeronautics and Space Act [42 U.S.C. 2457(f)], to the Stanford University, Stanford, California 94305.

Source: S. E. Harris of
Stanford University
under contract to
NASA Headquarters
(HQN-10715)

No further information available per letter from Edward T. Sullivan/KT/NASA dtd 11-22-73

Category 03