

Image credit: NASA/Daniel Bivolaru

Optics

Fast Optical Shutter, Chopper, Modulator, and Deflector

New application of a DLP mirror/aperture as an optical shutter as a means of improving performance of existing optical instruments

There are numerous experiments and activities in which a laser or light beam needs to be chopped or shuttered (rapidly turned on and off) or modulated spatially or in time. In many applications, shuttering needs to be done rapidly to improve signal-to-noise ratio or improve performance of the optical device being used. Current methods have limited speeds or are excessively large or expensive. The new device can perform these actions using a small, inexpensive, optically and electrically efficient, optically high quality, and computer-controlled method.

BENEFITS

- Improved signal to noise ratio
- Two times cheaper than existing technology
- Three times faster than existing technology
- Easy to use and maintain

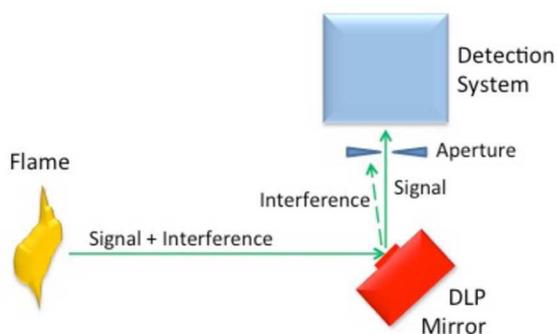
technology solution



THE TECHNOLOGY

A laser or a light source is incident on a detector. It usually passes through a shutter that can open and then close to limit the amount of light hitting the detector. There are limitations on the speed, size and cost of such apertures. The design of this technology uses DLP mirror technology. It can rapidly deflect the incoming light beam onto an aperture, which blocks the beam path, or through the aperture, which allows it to go onto the detector. The DLP mirror in this shutter uses an aperture design that is nearly 3 orders of magnitudes faster (shorter exposure time) than similar-sized aperture using conventional commercial-off-the-shelf mechanical shutters and 1-2 orders of magnitude smaller and cheaper than higher-performing custom-made shutters that are used by a few labs around the world.

The DLP mirror is actuated via a computer controlled oscillator circuit. A laser beam directed to the mirror is either passed to a target detector, or diverted, based on the inputs from the circuit. In this manner, the DLP mirror / circuit can act as a fast shutter, modulator, or chopper for the light beam. One novel feature of this invention is the application of the DLP to divert a beam onto or off a detector for instrumentation systems.



Interference Deflected onto Aperture while Signal Transmitted to Deflector. Image credit: NASA/Paul M. Danehy

APPLICATIONS

The technology has several potential applications:

- High speed optical imaging in medical, communications and scientific research
- High speed photography or spectroscopy in luminous environments
- Lithography and laser beam shaping
- Instruments for pharmaceutical detection, chemical analysis and consumer food analysis

PUBLICATIONS

Patent Pending

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