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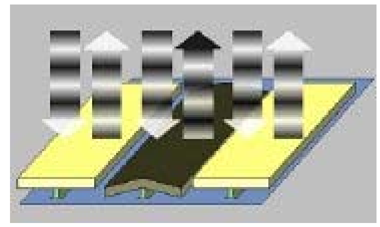
Micralyne Spatial Light Valve (SLV)

Micralyne has been working on a fast optical switch array for five years now, and is now exploring a number of potential applications and configurations.



The main focus of this product research to date has been solving the materials and process issues associated with surface micromachining - issues unavoidable when using thin films as structural parts. This research has been worthwhile; the resulting diffractive thin film structures provide a high speed and versatile switch with a minimum of process steps.

Examples of diffractive switches include Silicon Light Machines' Grating Light Valve (GLV) and Kodak's Grating ElectoMechanical Switch (GEMS). Both devices sacrifice reflectivity at the zeroeth order (direct reflection) in order to be used at the first diffractive order. This is consistent with their intended use for high-contrast projection display applications. The Micralyne SLV can operate in this mode to achieve such high contrast, but can additionally be used in the zeroeth order to achieve over 96% throughput of the laser wavelength being used. Using the first order to gain contrast requires wasting up to half of the source laser energy, as well as complicating the optical system. In addition, the SLV structure affords exceptional switching speeds, in the tens of MHz. This enables data throughput in the tens of Gbit/second rates, useful for high resolution displays or high pixel count graphic arts applications.

The manufacture of the SLV device is a dedicated MEMS process, with just three masks and no polishing steps. Others, including TI for their DMD process, use a compromise CMOS-like process, adding consideraton for optical and film stress issues. This adds processing cost and increases optical system costs down the line. The SLV can be tuned through an analog range in the "on" reflective state to compensate for laser and optical system inhomogeneity, and can be used at a variety of angles to simplify optical design. This makes the SLV a low cost and high performance device to design optics around.

The MEMS process used to make the SLV has also shown switching of wavelengths which no other device on the market can handle, from CO_2 laser wavelengths of 10.6 microns at high power, to designs which function at short UV wavelengths with low losses. Arrays of up to one thousand elements have been developed, and further growth is readily possible. We hope to pursue this high power CO_2 switching ability to move the present state of laser marking from tens of kBits/second data rates to the GBit/second area, enabling marking of complex images on irregular shapes instead of the familiar dot matrix printer look of present CO_2 laser marked date codes. The high throughput efficiency for UV applications will allow the expensive laser energy to be switched with practically no energy loss.

In summary, the SLV offers a high speed and high throughput linear array of switch elements useful for a wide range of wavelengths and applications.

- Glen Fitzpatrick, Chief Scientist, Micralyne Inc. -