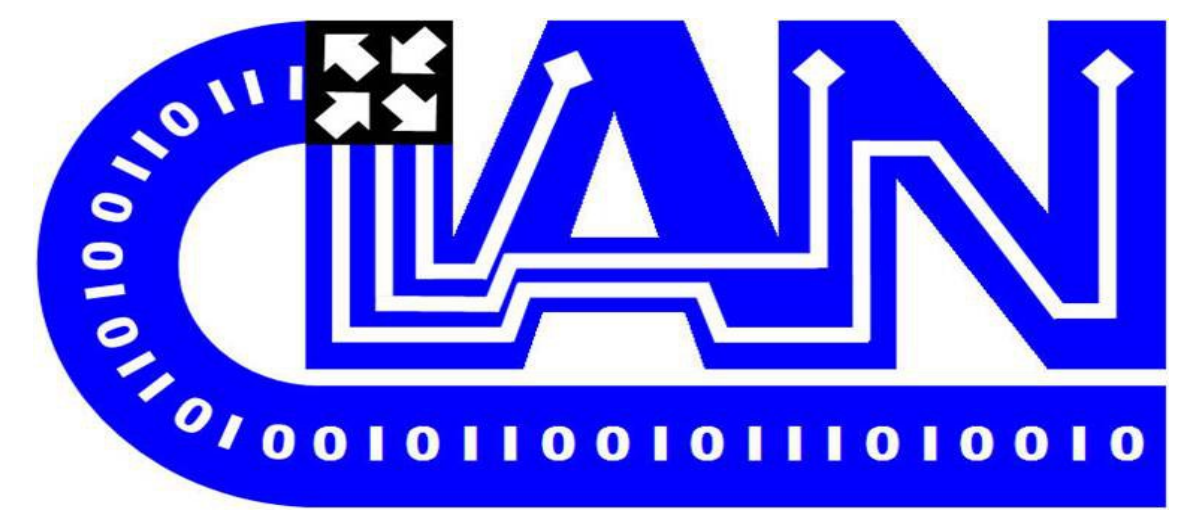




Fast Optical Switch for Data Communication Applications



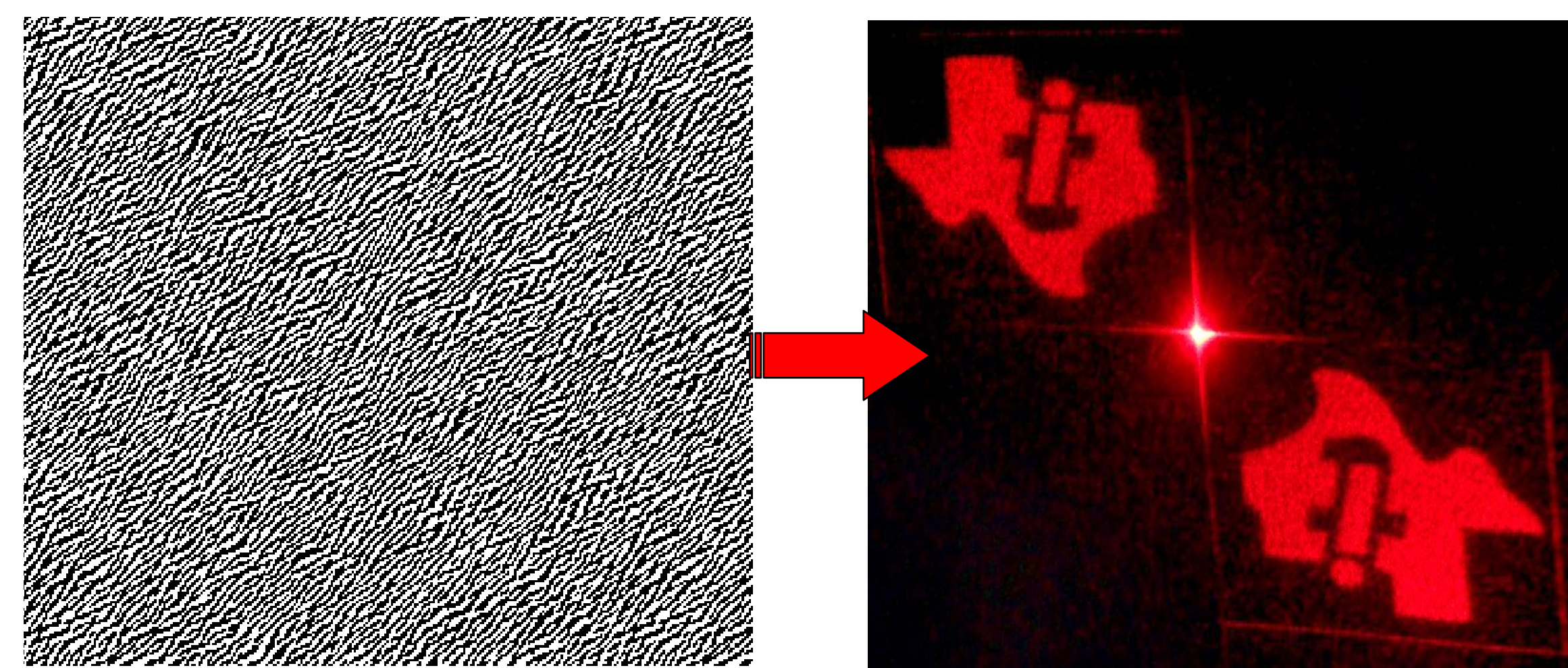
Brittany Lynn, Pierre-Alexandre Blanche, Daniel Carothers, John Wissinger, Alexander Miles, Prof. Robert A. Norwood, Prof. Nasser Peyghambarian, University of Arizona

Thrust 3

We demonstrated a diffraction based non-blocking N x N optical switch employing a digital micro-mirror display (DMD) which performs 20 times faster than currently available technology and is easily scalable. The holographic nature makes this system more robust than one-to-one reflective systems where a single mirror failure incapacitates an entire connection. We are addressing a key bottleneck in data centers and optical aggregation networks by decreasing circuit-switching speed and allowing for straightforward port count scalability.

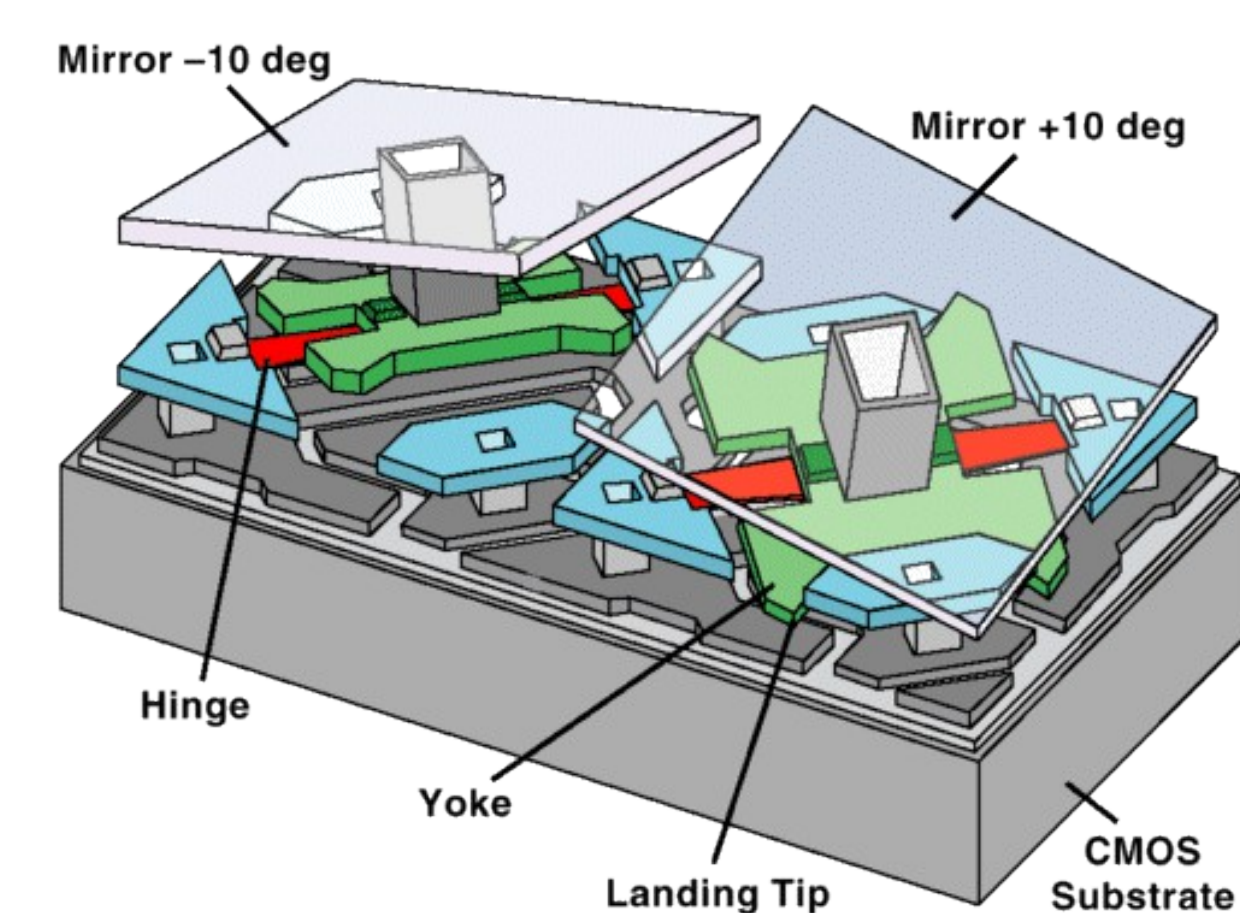
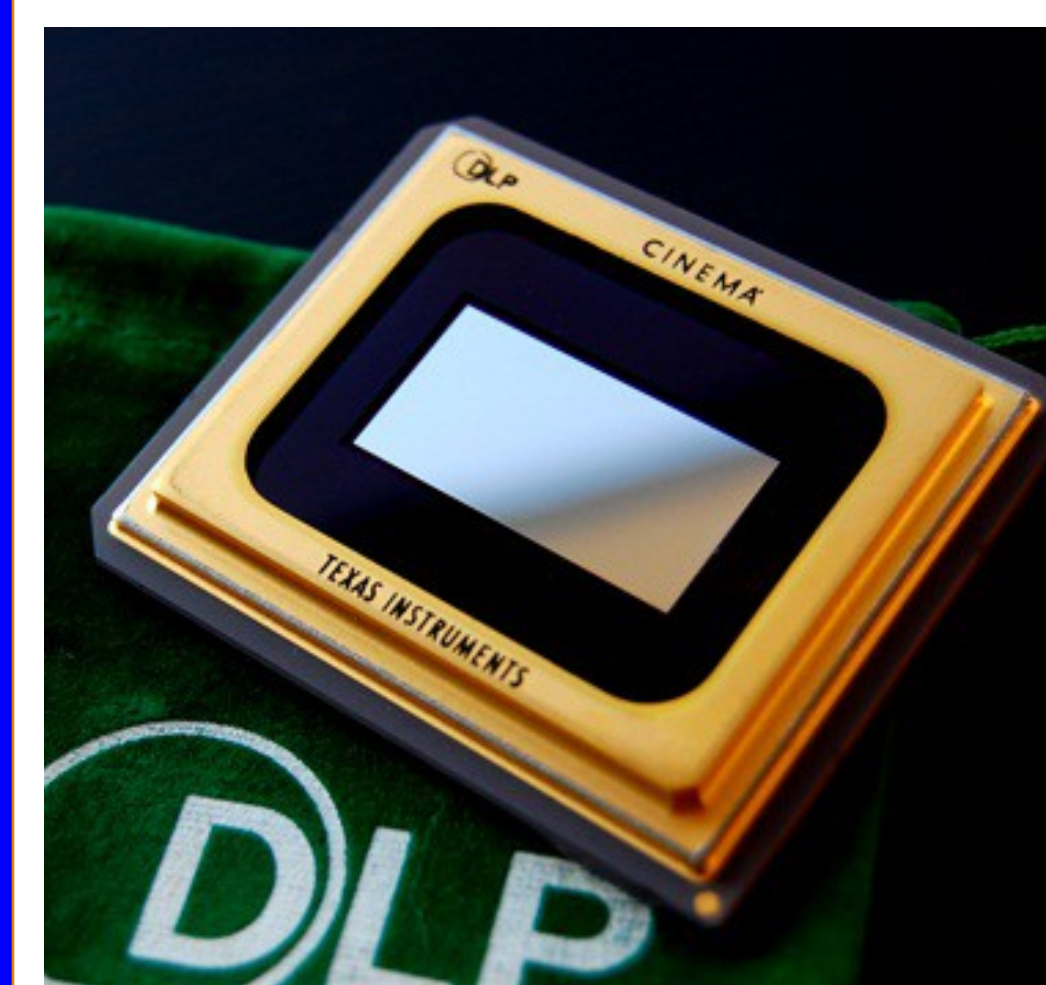
Technical Approach

Beam steering through diffractive optical elements



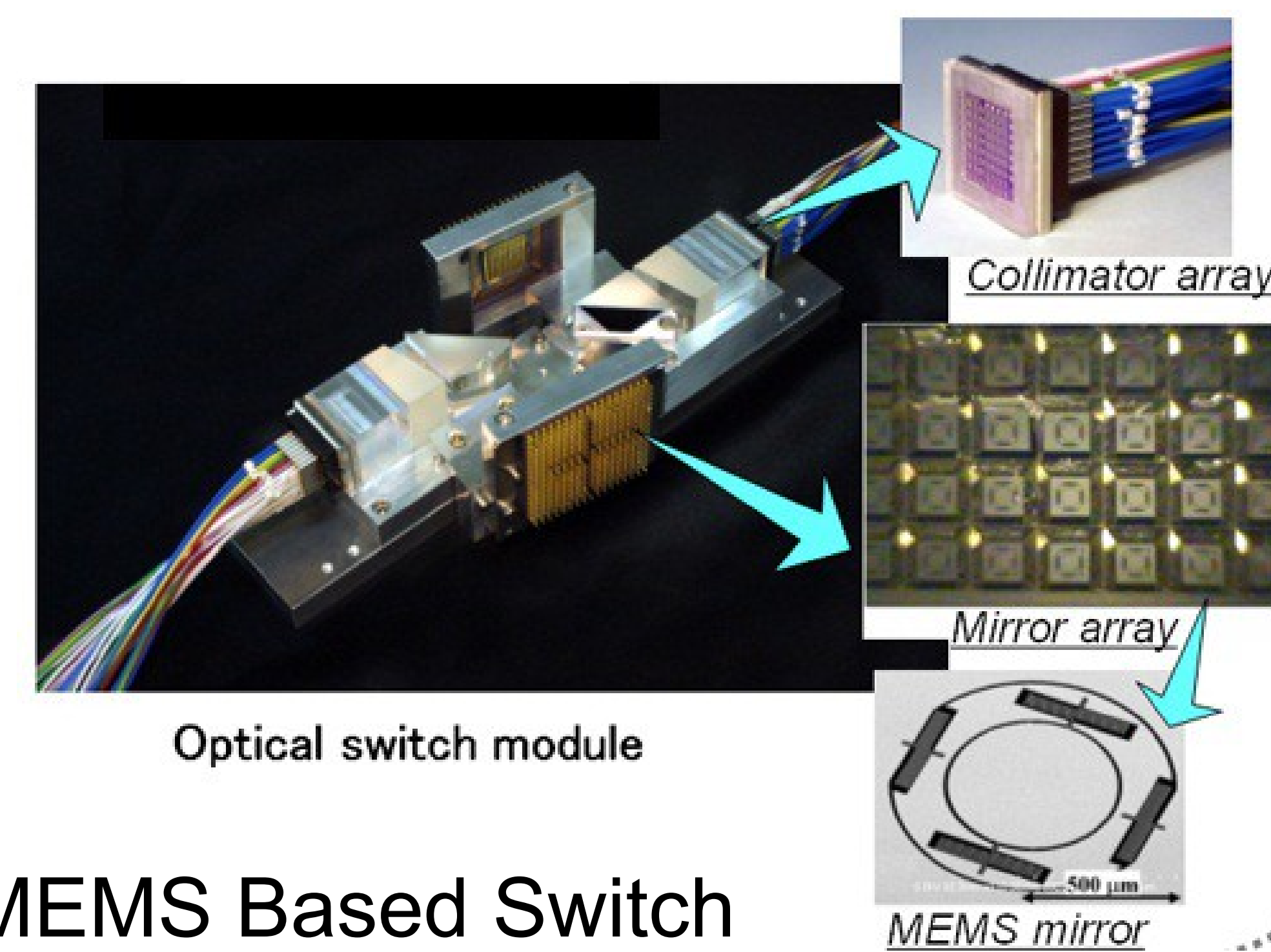
Computer generated diffraction pattern and the resulting image upon coherent illumination

TI DMD + hologram = fast optical switch with data rate independent performance



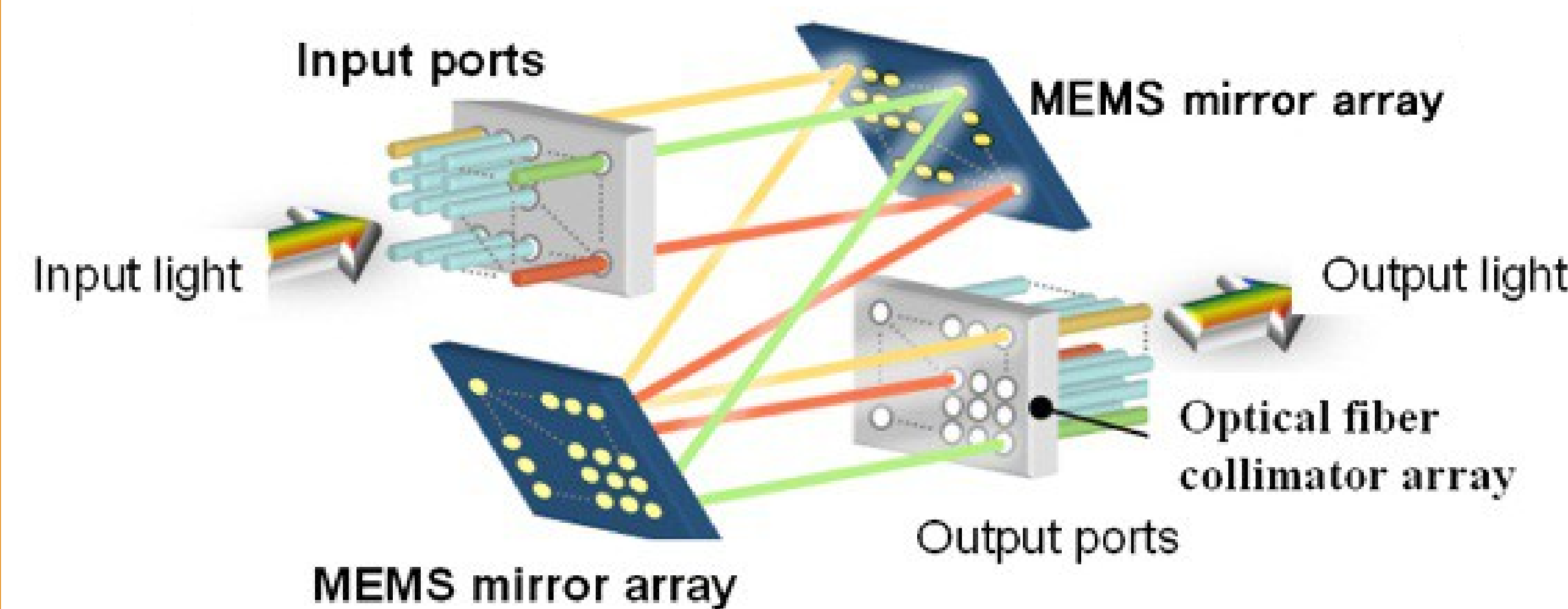
- Bistable
- 50µs switching time
- Robust

Related Work & State of the Art



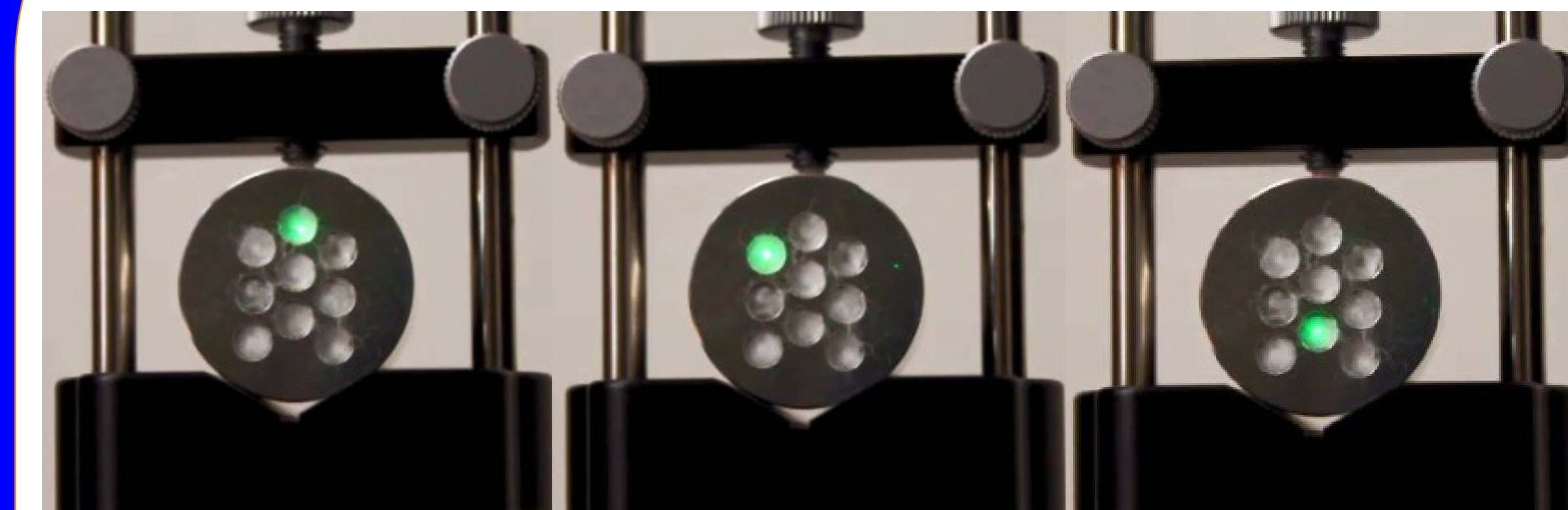
MEMS Based Switch

- Compact
- Low insertion loss



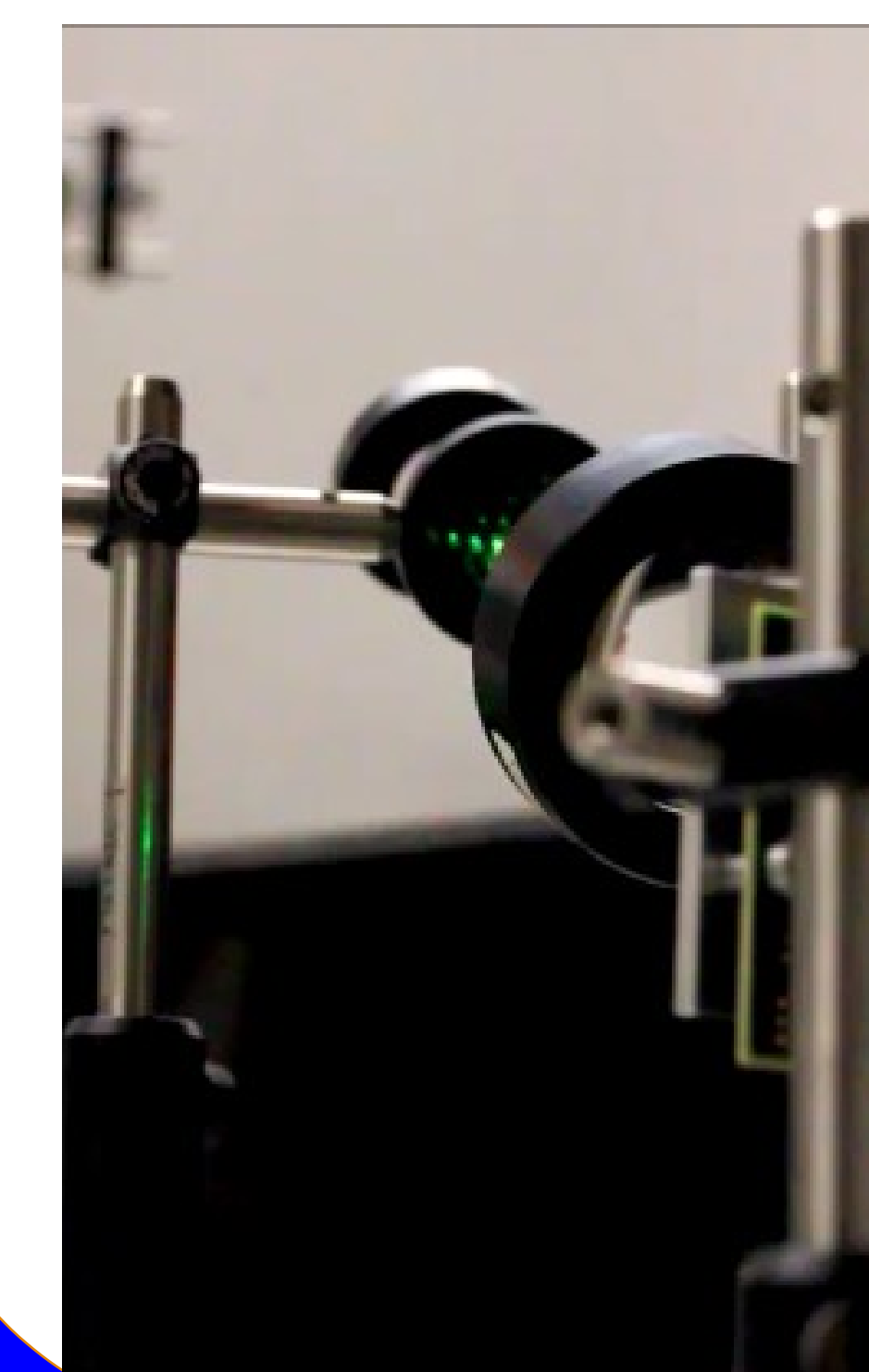
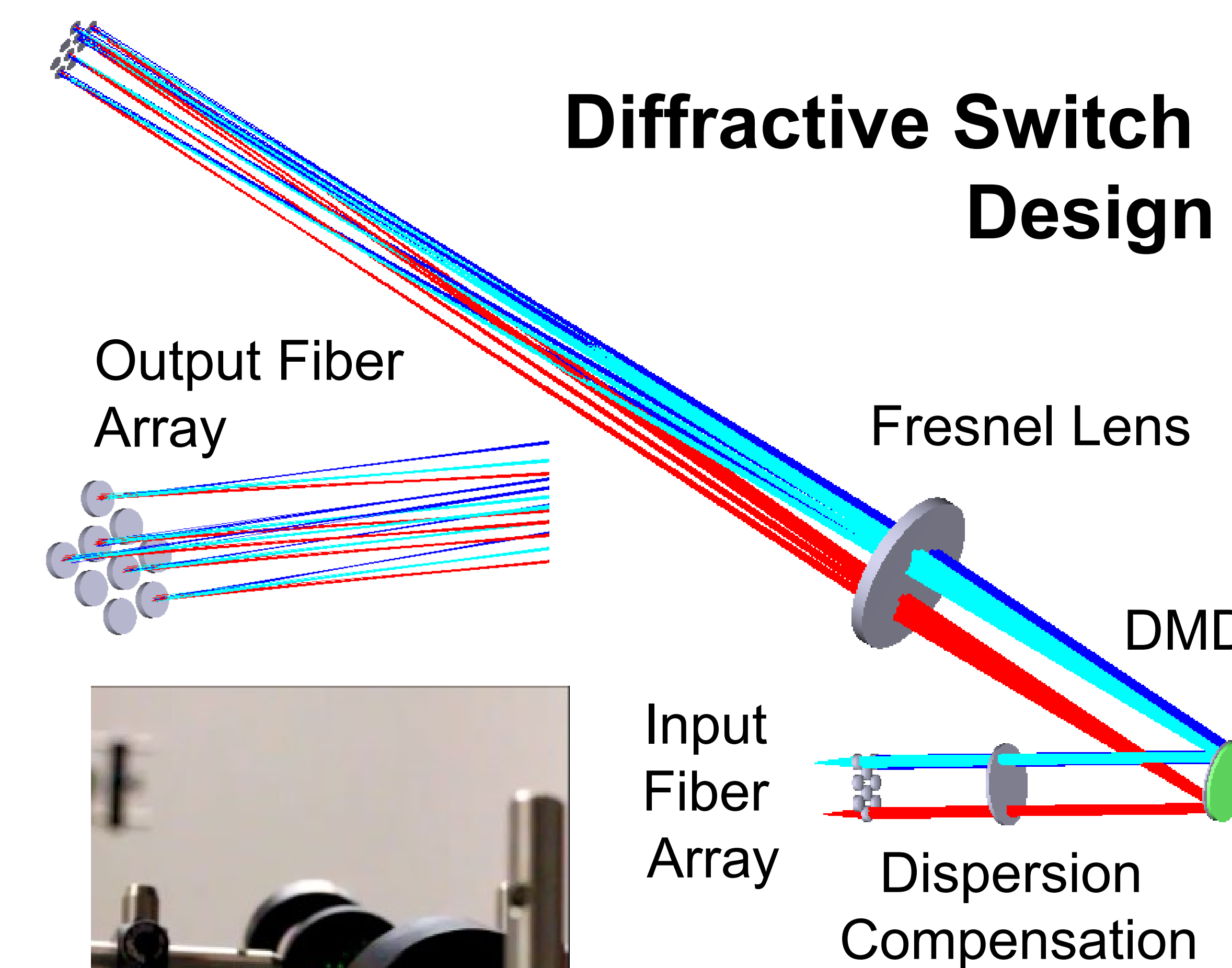
- Feedback loop for position control
- 10s of ms switching time
- \$1K per port and up
- Mirror failure = port failure

Results



Demonstrated 1x9 switch in the visible

Diffractive Switch Design

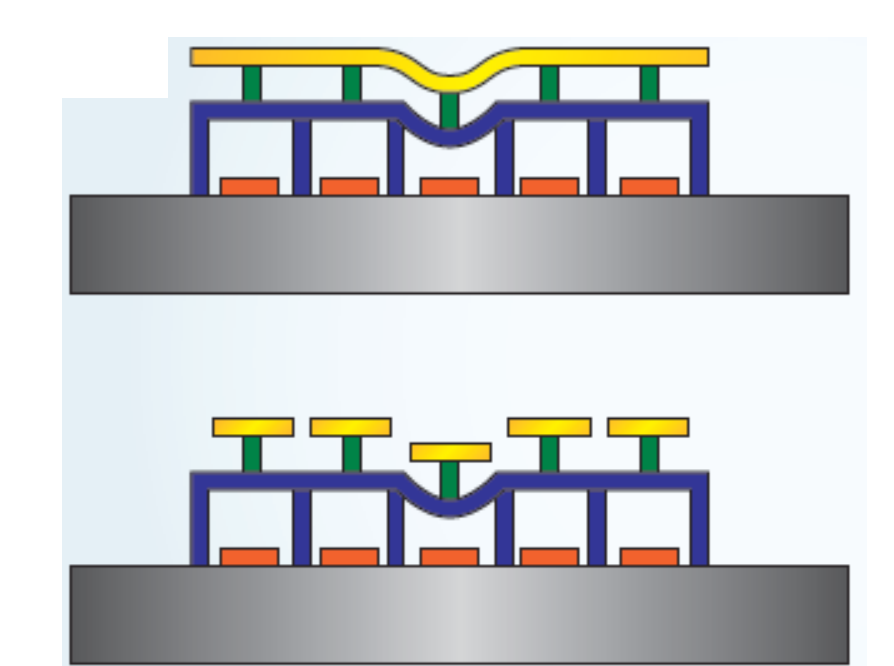
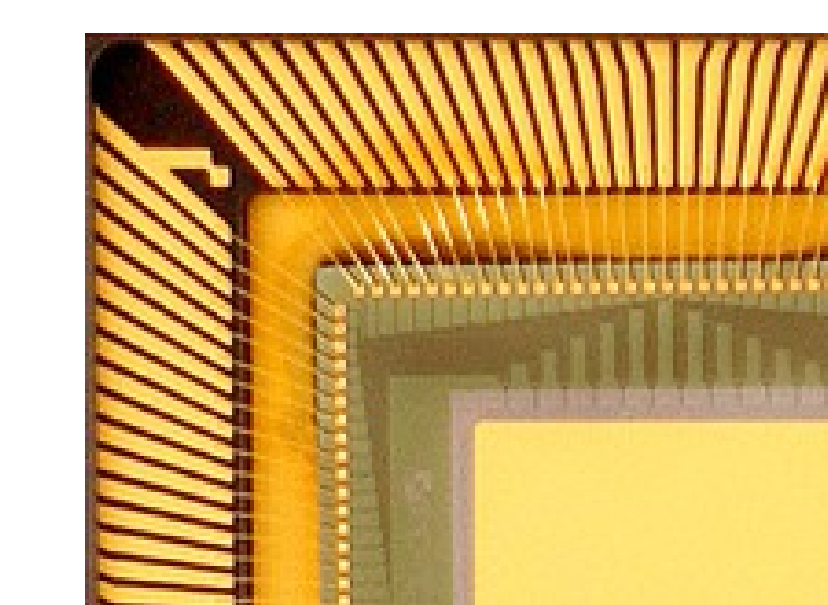


Input bundle and collimating mount

Future Plans

Milestone	Date
Implement at 1550 nm	3/29/2013
Free-space validation	4/5/2013
TOAN testbed insertion	4/19/2013

To increase the first order diffraction efficiency to >90% a multi-level phase control can be used. Piston MEMS technology is a promising alternative.



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- Texas Instruments

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