BOULDER NONLINEAR SYSTEMS

High-speed 1536×1536 LCoS Spatial Light Modulator

Custom designed for high-speed neuroscience applications

Combining high pixel count and high frame rate with efficient diffraction

Pixel Count: 1536 × 1536

Array Size: 30.7 mm × 30.7 mm

Pixel Pitch: 20 µm × 20 µm

Pixel Voltage: 12 V

Fill Factor: 96%

Maximum GS Hologram Frame Rate at 1064 nm: 600 fps (1000 fps available at reduced efficiency)

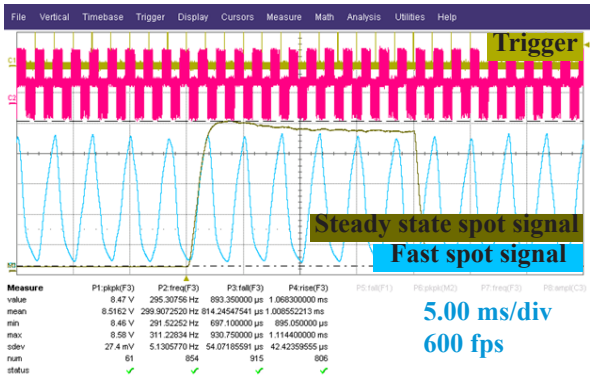
Trigger Response for On-board Holograms: 6 µs latency / 3-9 µs jitter

Fast hologram-to-hologram operation

The 1536 × 1536 SLM is built for speed. It uses large high-voltage, high-capacitance pixels which are essential for increasing switching speed. These factors also serves to reduce fringing field effects and phase ripple to improve photostimulation efficiency, especially at large diffraction angles. To optimize performance, the entire SLM head is thermally controlled for operation at elevated temperatures.

The SLM drive electronics receive 8-bit 1536 × 1536 phase masks from the host computer over a 16-bit PCIe pipeline for fast transfer rates. For further speed enhancement, a library of up to 2,045 user-specified phase masks can be stored on the driver board and then selected in any sequence using on-board OverdrivePlus transition calculation.

These capabilities work together to provide hologram-to-hologram frames rates of up to 600 fps at 89% of steady-state diffraction efficiency. Frame rates of up to 1,000 fps have been demonstrated with comensurate decreases in diffraction efficiency.



How we measure speed: BNS reports true hologram-to-hologram frame rates at 1064 nm. Specifically, the speed measurements reported here use on-board hologram storage with a library of different 8-spot beamsteering holograms generated by the Gerchberg-Saxton (GS) algorithm. Because the system can support running at higher frame rates than the liquid crystal can respond to, the diffraction efficiency relative to a static GS hologram is provided. Reported efficiency is average of 10 different hologram pairs to sample a wide range of transitions.