SPATIAL LIGHT MODULATOR BASED ON THERMO-OPTICS EFFECT

Hadrien M.L. Robert, Marek Piliarik

Institute of Photonics and Electronics,

Czech Academy of Sciences, Chaberská 1054/57,

18251 Prague, Czech Republic.

E-mail: robert@ufe.cz

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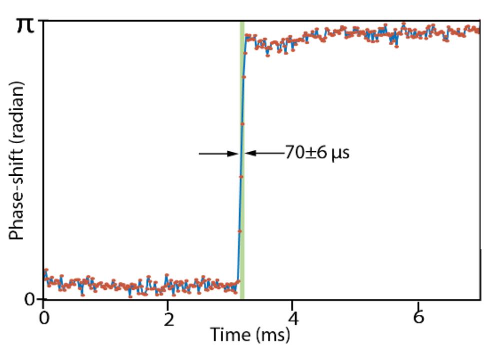
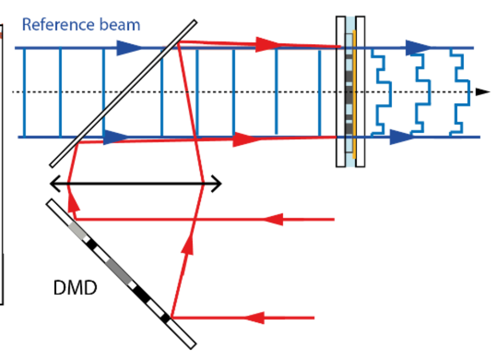
Thermo-optic effect in imaging system is often associated as side effects generating aberrations. Indeed, heat can induce mechanical drift or lens dilation, and macroscopic heating is intrinsically slow. However, on microscopic scale, the heat temporal response can reach the microsecond regime. An example of efficient micro/nanoscopic heat source is metal nanoparticles illuminated at their plasmon resonance. They can be used to shape temperature profile at the microscale [1] or as a thermal lens with variable focus [2-3].

We developed a novel spatial light modulator based on thermo-optics effect induced by gold nanoparticle, which outperform the state of the art in numerous aspect [4]. In comparison to the most commonly used liquid-crystal spatial light modulators, our system features no grating effect, is polarization insensitive, have high transmission rate (>80%) and could theoretically reach the sub µs response time. Using an interferometric microscope, we could characterize a phase pixel and measure π phase-shift (at λ=488 nm) and a response time of 70 µs (fig. 1). Furthermore, using patterned heating beam with a digital micromirror device (fig. 2), we managed to spatially monitor the optical phase of an incoming beam and perform beam shaping.

Figure left: Response time of a phase pixel measured with the interferometric microscope.

Figure right: Schematic principle of the spatial light modulator.





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