

SCULPTED LIGHT FOR IMAGING AND MICROMANIPULATION

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The ability to sculpt light fields using spatial light modulators (SLM) or Digital Micromirror Devices (DMD) has given us tools of choice for the production of configurable and flexible confining potentials at the nano and micron-scale. The use of sculpted light also provides substantial advances in improving resolution in imaging. We categorise the techniques used to create sculpted light to those based on time averaged methods and those utilizing spatial light modulators in either Fourier plane or direct imaging plane. A rapid angular modulation of Gaussian beam with a two-axis acousto-optic modulator, AOM, can be used as highly configurable time-averaged traps. This type of modulation has found applications in holographic tweezers as well as ring traps for ultra-cold atoms. SLMs can be used as a way of producing extremely versatile structured light fields. Another way for production of dynamical, fast and flexible structured light fields is using digital micromirror devices (DMD), which is based on direct imaging of amplitude patterns. DMD can configure the amplitude of an input beam either in the Fourier plane or in a direct imaging configuration. Sculptured light produced using these methods promises high flexibility and an opportunity for trapping and driving complex systems and trapping and manipulating nano and micron-size objects or even using these objects inside a biological cell.