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Talk Title: Probing and controlling strongly correlated matter with few photon fields

Abstract: 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. Sculpted light can be produced using time averaged methods and those utilising spatial light modulators. 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 for example ring traps for ultra-cold atoms. 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. We discuss how these highly flexible potentials can be used in studies in quantum atom optics and more specifically in atomtronics and in the studies of the gas phase of vortex matter.