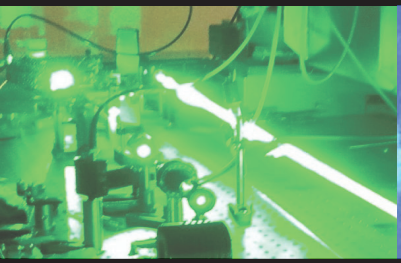
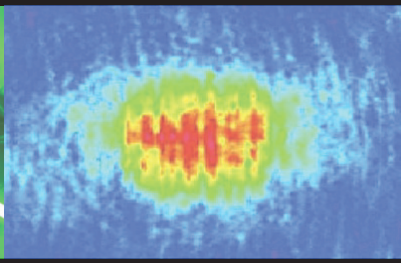
Joint UoC/FORTH AMO Seminar





18 December 2019, 16:30, Physics Department 3rd Floor Seminar Room

Spinning and stirring quantum gas superfluids

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The emergence of new technologies and techniques is providing the ability to sculpt light fields and create configurable optical potentials at the micron-scale for quantum gases. These techniques are leading to new avenues for configuration and control of Bose-Einstein condensates (BEC), realising atomtronic devices that exploit their superfluid and coherence properties. In this talk, I will present an overview of the techniques developed in our laboratory to create novel optical potentials for BEC. Broadly, we use two such methods; time-averaging of the optical field, by scanned optical beams, and a powerful new tool, the digital micromirror device (DMD), which allows dynamical structuring of the light field amplitude. Combining these techniques, we demonstrate the full control over the geometry, amplitude and phase of the Bose-Einstein condensate, and demonstrate on-demand vortex and sound excitations in the BEC superfluid. Finally, I will outline the recent progress with mixtures of superfluids composed of atoms in different hyperfine states. By utilising magnetic fields and spin-dependent optical potentials, we have demonstrated spin-dependent driving of superfluids in line and ring traps.

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