Abstract Submitted
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Characterizing the potential profile of an atom trap using tomographic fluorescence imaging[1] EDWARD MOAN, TANWA ARPORNTHIP, CHARLES SACKETT, UVA — We have developed a technique to fully characterize an arbitrary potential profile of an atom trap. A cold, but not condensed, atom cloud is first loaded into the trap and allowed to equilibrate. The trap is then turned off and the atoms are rapidly pumped into a dark state, such that they do not interact with light from a probe laser. A selected slice of the atom cloud is reactivated by repump light that is cylindrically focused into a light sheet with an appropriate thickness. The reactivated cross-sectional region interacts with the probe laser light to create a fluorescence image which is viewed perpendicular to the sheet. The light sheet can be translated to generate cross-section images of the cloud at different positions. Combing these cross-sections provides a full three dimensional profile of the atom cloud, much like tomographic imaging used in medical imaging. From the cloud profile the trap potential function is readily determined. We have demonstrated the technique using Rb atoms in a time-orbiting trap. We verified that the potential obtained had the correct anharmonic terms, when compared to an analysis of the trajectory of a Bose-Einstein condensate moving in the trap. The tomographic technique is both faster to acquire and in general simpler to analyze.

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