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Polarization sensitive imaging of a spinor Bose–Einstein condensate MAITREYI JAYASEELAN, JOSEPH D. MURPHREE, JUSTIN T. SCHULTZ, ZEKAI CHEN, NICHOLAS P. BIGELOW, University of Rochester — With magnetic and optical techniques enabling the creation of interesting topological spin textures in spinor Bose–Einstein condensates (BECs), the interaction and evolution of these systems has become a burgeoning field of research. However, the standard absorption imaging techniques ubiquitous in atomic physics experiments are completely destructive, making evolution studies difficult. Here we investigate a dispersive polarization-sensitive imaging method that allows access to the populations and coherences between spin states in the BEC, thereby enabling a full reconstruction of the spinor wavefunction. The tensorial nature of the linear atomic susceptibility allows us to utilize the polarization of the optical electric field to probe atomic properties by analyzing the transmitted optical polarization. Since this method may be non-resonant it is able to be minimally destructive, allowing repeated measurements on a single evolving BEC. Varying the parameters of the imaging system such as detuning and intensity of the imaging beam offers a way to characterize our procedure in terms of atom number loss and the signal-to-noise ratios accessible in our system.

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