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Magnetometry with Spinor Condensates SABRINA LESLIE, JAMES HIGBIE, MUKUND VENGALATTORE, LORRAINE SADLER, DAN STAMPER-KURN, Department of Physics, UC Berkeley — We demonstrate the use an F=1 spinor Bose Einstein condensate as a magnetometer with high spatial resolution. The magnetization profile of the condensate is non-destructively imaged and from a sequence of such images, the temporal phase of a Larmor precessing transversely magnetized spinor condensate is extracted. Interactions in a spinor condensate are rotationally symmetric, and thus the precession frequency is expected to be density independent. Comparison of this phase with a local oscillator after a coherent evolution yields a spatially-resolved measurement of the magnetic field. Preliminary experiments have been performed in which a local magnetic field is applied optically to part of the condensate using the spin-dependence of the AC Stark Shift. The present resolution of this magnetometer is 9nG for a spatial resolution of 6 microns, or 144 pG should the condensate be used as a single-channel magnetometer. This method is best suited for mapping magnetic field inhomogeneities with high spatial resolution, ultimately rivaling the performance of spatially-scanned SQUID magnetometers.

Sabrina Leslie
Department of Physics, UC Berkeley

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