Abstract Submitted
for the DAMOP05 Meeting of
The American Physical Society

Reconstruction of the phase of matter-wave fields using nonlinear wave-mixing DOMINIC MEISER, Optical Sciences Center, The University of Arizona, Tucson, Arizona 85721 — We investigate the prospects of a matter-wave version of the so-called FROG nonlinear autocorrelation technique for the recovery of amplitude and phase of the condensate wave function of a Bose-Einstein condensate. For more than a decade, this method has been used successfully for the measurement of the amplitude and phase of ultra-short laser pulses. Key features of the FROG technique are its high resolution, versatility and stability against noise and some sources of systematic errors. After showing how its analogue can be realized for Bose-Einstein condensates, we apply it to the measurement of the wave function of a vortex state. The impact of a reduction of the number of measurements and typical sources of noise on the field reconstruction are analyzed.

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Date submitted: 25 Jan 2005 Electronic form version 1.4