Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Quantum computing with Bose–Einstein condensate Bragg interferometry MARK EDWARDS, Georgia Southern University and NIST, CHARLES W. CLARK, Joint Quantum Institute, NIST and University of Maryland, JEFFREY HEWARD, BRANDON BENTON, Georgia Southern University — Quantum computers use the interferences of different computational paths to enhance correct outcomes. Quantum computation can be viewed as multiparticle computational interference [1]. We describe how quantum circuits can be mapped to interferometry experiments performed on BECs using Bragg pulses. We extend an approach originally developed to model Bragg interferometry of BECs [2], to describe new interferometers based on quantum information concepts. This approach follows ideas recently introduced in neutron interferometry [3]. Using techniques that have been well calibrated by experiments in conventional BEC interferometry [2], we model the experiments associated with some simple quantum circuits using the prototyping method mentioned above. We prototype extensions to standard Mach-Zehnder configurations, analogous to the four-blade designs of neutron interferometry.

[1] R. Cleve, Proc. R. Soc. Lond. A **454** 339 (1998) et al.
[2] J. E. Simsarian, *et al.*, *Phys. Rev. Lett.* **85**, 2040 (2000)
[3] D. A. Pushin, M. Arif, and D. G. Cory, *Phys. Rev. A* **79**, 053635, (2009)

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Date submitted: 27 Jan 2010 Electronic form version 1.4