Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Phase transitions in rotating Bose-Einstein condensates.[1] OLEG VOROV, KLAUS BARTSCHAT, Drake University, P. VAN ISACKER, G.A.N.I.L. (France) , M. HUSSEIN, Universidade de Sao Paulo (Brazil) — Phase transitions, or abrupt changes of state under a smooth variation of external conditions, are of great interest in natural sciences. A remarkable property of a Bose-Einstein superfluid in a rotating bucket is its change to a vortex state once the bucket's rotational velocity exceeds a critical value. This transition to the Abrikosov state has been observed in cold atomic gases [1]. Such critical behavior is very sensitive to the interaction between the particles in the condensate [2,3]. We give an analytic description [4] of the first phase-transition point and classify the types of the corresponding instabilities that depend on the interaction. This toy model of a continuous phase transition predicts the same behavior patterns for all systems governed by a similar energy functional. [1] V. Schweikhard, I. Coddington, P. Engels, V. P. Mogendorff, and E. A. Cornell, Phys. Rev. Lett. **92**, 040404 (2004). [2] O. K. Vorov, P. Van Isacker, M. S. Hussein and K. Bartschat, Phys. Rev. Lett. **95**, 230406 (2005). [3] O. K. Vorov, M. S. Hussein and P. Van Isacker, Phys. Rev. Lett. **90**, 200402 (2003). [4] O. K. Vorov, P. Van Isacker, M. S. Hussein and K. Bartschat, submitted to Nature (2006).

[1]Work supported by NSF (USA), CEA (France), and FAPESP (Brazil).

Klaus Bartschat
Drake University

Date submitted: 27 Jan 2006 Electronic form version 1.4