Abstract Submitted
for the APR12 Meeting of
The American Physical Society

Quantum Stabilization of General-Relativistic Variable-Density Degenerate Stars DAVID COX, Department of Physics, University of Connecticut, Storrs, Connecticut 06268, RONALD MALLETT, Department of Physics, University of Connecticut, Storrs, CT 06268, MARK SILVERMAN, Department of Physics, Trinity College, Hartford, CT 06106 — A previous investigation by one of the authors showed that the critical mass of a constant-density neutron star can become greater than eight solar masses under conditions of neutron condensation to form a separate phase of composite bosons, provided the scattering length of the bosons was on the order of a picometer. That analysis employed Newtonian gravity, but general relativity provides a more fundamental analysis. Using general relativity, a Klein-Gordon Lagrangian density with Gross-Pitaevskii term for the bosons, and an effective-field approximation for neutrons, we have determined the equilibrium states of a collapsed star in a spherically symmetric variable-density single phase comprising a ground-state boson condensate and degenerate gas of noninteracting neutrons. Our calculations show that boson scattering lengths of about 20 picometers can prevent collapse to stellar black holes.

David Cox
Dept of Physics, University of Connecticut, Storrs, Connecticut 06268

Date submitted: 14 Feb 2012 Electronic form version 1.4