Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Zeeman engineering in spinor Bose-Einstein condensates: topological interfaces and confined textures[1] MAGNUS O. BORGH, JUSTIN LOVEGROVE, University of Southampton, MUNETO NITTA, Keio University, JANNE RUOSTEKOSKI, University of Southampton — Engineering of the Zeeman level shifts in spinor Bose-Einstein condensates (BECs) provides a powerful tool in simulating a rich phenomenology of physical phenomena that have been encountered in cosmological or condensed-matter systems. We propose [1] using spatial control over the Zeeman shifts as an experimentally accessible way to study defects and textures at interfaces between topologically distinct regions [1,2]. In a spin-1 BEC, we construct spinor wave functions representing defects and textures that connect continuously between polar and ferromagnetic regions induced by nonuniform Zeeman shifts. By numerical energy minimization we characterize the core structures of energetically stable interface-crossing defects. We also show that the spatial control over the Zeeman shifts can be used to engineer states where the core of a defect confines a topologically nontrivial texture or defect of lower dimensionality. We demonstrate engineering of an energetically stable one-dimensional Skyrmion texture inside the ferromagnetic core of a vortex in the polar spin-1 BEC.

[1] M. O. Borgh, J. Lovegrove and J. Ruostekoski, New J. Phys. **16,** 053046 (2014).
[2] M. O. Borgh, and J. Ruostekoski, Phys. Rev. Lett. **109,** 015302 (2012)

[1]We acknowledge financial support from the EPSRC.

Magnus O. Borgh
University of Southampton

Date submitted: 30 Jan 2015 Electronic form version 1.4