Abstract Submitted
for the DAMOP10 Meeting of
The American Physical Society

Controlling spin dynamics in a one-dimensional quantum gas[1]
NICOLAAS VAN DRUTEN, PHILIPP WICKE, SHANNON WHITLOCK, Universiteit van Amsterdam, The Netherlands — Reducing the dimensionality of a system has dramatic consequences and leads to remarkable new physics. In this regard, quantum gases offer unique opportunities to address important open questions in quantum many-body physics, by allowing full control over all relevant parameters. We create coherent superpositions of both spin and motional degrees of freedom and probe spin dynamics of a one-dimensional (1D) Bose gas of ^{87}Rb on an atom chip. We observe interaction-driven focusing of one spin component by mean field interaction with another component, directly related to the effective 1D interaction strength. We demonstrate experimental control over the 1D interaction strengths through state-selective radio-frequency dressing. The focusing behavior is altered by tuning the transverse trapping potential in a state-dependent way. This enables, for instance, access to the point of spin-independent interactions where exact quantum many-body solutions are available.

[1]Supported by FOM, NWO and EU

Nicolaas van Druten
Universiteit van Amsterdam, The Netherlands

Date submitted: 22 Jan 2010 Electronic form version 1.4