Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Experiments on the Verification of the 1-D Tan Relations for Bosons in an Atom Chip Waveguide JASON ALEXANDER, VIOLETA PRIETO, CHRISTOPHER ROWLETT, PATRICIA LEE, WILLIAM GOLDING, Sensors and Electron Devices Division, U.S. Army Research Laboratory, Adelphi, MD — Recently it has been shown that a single quantity called the "contact" characterizes the behavior of interacting fermions at short distances. A set of universal relations was developed connecting the contact to the long range, thermodynamic properties of a gas of fermions. Some of these relations have been verified experimentally for fermions and bosons in three dimensions. As a result there has been a great deal of theoretical interest in this area and similar relations have been developed for bosons in 1-D. In this work, we continue to report results on the experimental verification of some of these 1-D relations for a system of bosons (^{87}Rb) confined to the (quasi) 1-D potential of an atom chip magnetic waveguide. We measure the contact via the momentum distribution for various inter-particle interaction strengths. We discuss how the contact can serve as a marker for the phase transitions between the thermal gas, the Bose-Einstein condensate, and the Tonks-Girardeau gas. Previously, we reported very preliminary results for a 1-D thermal gas. Here we report measurements of the contact for a 1-D condensate and discuss progress towards observing the transition to the Tonks-Girardeau regime for atoms in our atom chip waveguide.

Jason Alexander
Sensors and Electron Devices Division,
U.S. Army Research Laboratory, Adelphi, MD

Date submitted: 31 Jan 2012 Electronic form version 1.4