Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Josephson Junctions for a BEC in a Toroidal Trap CHANGHYUN RYU, ALINA BLINOVA, PAUL BLACKBURN, MALCOLM BOSHIER, Los Alamos National Laboratory — The Josephson Effect is one of the most important consequences of superconductivity and superfluidity. It also plays a crucial role in many technological innovations, including the SQUID. Previous experimental work on creating Josephson Junctions and studying the Josephson Effect with a BEC has mostly relied on somewhat inflexible methods to create the junctions, limiting possible geometries. Here we report our work towards creating arbitrary Josephson Junction arrays based on our "painted potential" method for manipulating BECs. In the previous work, arbitrary potentials for a BEC, including a toroidal trap, were created by using the time averaged optical dipole potential of a 2D scanning laser beam. To implement tunneling junctions, a high resolution long distance objective was installed, allowing painting of arbitrary potentials with a resolution of 1.5 micron. One particularly interesting Josephson Junction geometry is that of a BEC in a toroidal trap with tunneling junctions, which would be analogous to a SQUID. This configuration can be used to sense rotation and create a Schrödinger cat state of different flow states. Towards this goal, we painted two symmetric Josephson Junctions for a BEC in a toroidal trap and studied Josephson effects in this set up. In this poster we will report progress on this experiment.

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Date submitted: 27 Jan 2012 Electronic form version 1.4