

DAMOP14-2014-000467

Abstract for an Invited Paper
for the DAMOP14 Meeting of
the American Physical Society

Experimental investigation of spin-orbit coupled BECs¹

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The generation of artificial gauge fields has emerged as a central tool to study condensed matter phenomena using ultracold quantum gases. In this context, the implementation of spin-orbit coupling is an advancement that is currently met with great interest, both theoretically and experimentally. In our lab we have implemented spin-orbit coupling by using a Raman dressing scheme and have studied the physics arising from a combination of spin-orbit coupling and an optical lattice. Since both spin-orbit coupling as well as an optical lattice strongly modify the dispersion relation, interesting bandstructures result from the combination of the two. We have probed such bandstructures by placing BECs into a moving spin-orbit coupled lattice while measuring atom loss rates due to modulational instability. Our experimental results are corroborated by a matching theoretical analysis. The current status of our ongoing investigations will be reported.

¹We acknowledge funding from NSF and ARO.