PHYSICS&ASTRONOMY
THE UNIVERSITY OF TEXAS AT SAN ANTONIO

Dissertation Defense

Shanna Pahl

Date: **:Wednesday, April 18th, 2018**

Time: **4:00 pm**

Location: **AET 3.328**

Campus: **Main Campus**

Advisor: **Dr. Zlatko Koinov**

Abstract

Superfluidity of Fermions in Optical Lattices

We have investigated two major areas of study concerning 2D optical lattices: mass-Imbalance and its associated superfluid phases and collective excitations, and the emerging physics of spin orbit coupling (SOC) in optical lattices. With the former, the phase diagram presents with a unique topology that exhibits a Fulde-Ferrell phase where phase separation is typically found, and the collective excitations exhibit anomalous dispersion more closely related to Bose versus Fermi superfluidity. In the latter, the BCS-BEC crossover has been identified. SOC and SOC with a Zeeman field substantially change the nature of the crossover not only by reducing the interaction strength at which the crossover occurs, but there are two types of transitions: (a) Weak singularity SOC induced crossover with chemical potential equal zero as expected, and (b) a Zeeman induced topological phase transition featuring an isolated Dirac cone with positive chemical potential.

Belinda Tucker • 210.458.8517 • Belinda.Tucker@utsa.edu
http://utsa.edu/physics/