# 清华大学高等研究院

Institute for Advanced Study, Tsinghua University

## 学术报告

**Title:** **Dynamics of Collective Excitations in quasi-2D Dipolar Bose gases**

**Speaker:** **Stefan Natu**
***University of Maryland***

**Time:** **3:00pm, Monday, August 25, 2014**

**Venue:** **Conference Hall 322, Science Building, Tsinghua University**

## Abstract

One of the most exciting developments in ultra-cold gases in recent years has been the successful trapping and cooling to degeneracy of atoms with large magnetic dipole moments. These developments have heralded the study of superfluidity in the presence of long range dipolar interactions, and a number of intriguing predictions have been made about the thermodynamic and collective behavior of such fluids such as anisotropic superfluidity and the appearance of a roton-maxon like excitation spectrum in quasi-2 dimensions. In this talk I will discuss the near and far from equilibrium dynamics of collective excitations in a quasi-2D (pancake) dipolar superfluid. Strikingly, we find that collective excitations in this system can be extremely long lived, and only exponentially weakly damped even at finite temperatures, in stark contrast with non-dipolar superfluids. Furthermore, by tuning the orientation of the dipoles with respect to the axis of the pancake, the damping rates can be made highly anisotropic. Our results can be tested in current generation experiments on dipolar gases using Bragg scattering. I will also discuss the far from equilibrium dynamics of collective excitations following a sudden quench in the interactions. Remarkably, at short times following the quench, the occupation of rotons is significantly enhanced, which produces observable signatures in the momentum distribution of the quasi-2D gas. In particular, I will show how the roton gap can be directly extracted from such a quench measurement.