

Chen-Chao Zhao

RESEARCH EXPERIENCE

CURRENT, FROM NOV 2012

Thesis at Institute for Advanced Study under Hui Zhai

High-Spin Atoms

AUG 2012 – NOV 2012

At Beijing Normal University under Su-Peng Kou

Novel London moments in rapidly rotating topological insulators

- I devised a universal and quantum mechanical formalism of non-inertial effects in rotating crystals, consistent with London moment in superconductors and Barnett's effects.
- In contrast to trivial crystals, I predicted theoretically two novel types of moments in rotating topological insulators (TI) in the presence of an auxiliary magnetic field.
- When the auxiliary field is applied parallel or radially perpendicular to the rotation axis, one will observe a quadratic magnetic moment and an electric moment respectively.
- I suggested a "solenoid" structure and lock-in measurement to improve detectability and precision.
- I also pointed out that the experiments will shed light on interactions inside a TI and clarify some controversies over rotating crystals.

AUG 2012

Undergraduate Research

Rashba-Dresselhaus competition in 2D spinor BEC

- I combined the two spin-orbit coupling strengths into a single complex parameter $\tilde{\kappa} = \kappa e^{i\alpha}$ with argument α characterizing the mixing.
- In the free particle model, I demonstrated explicitly how the ground state degeneracy evolves as a function of α ;
- Effects of Zeeman term and parity breaking term on dispersion relation were also studied.

BACKGROUND & SKILLS

- Fortran, Octave (Matlab), Gnuplot, Maxima, Inkscape, L^AT_EX; Linux (Debian)
- TOEFL 111 = R 28 + L 27 + S 28 + W 28
- Cold Atoms, TI/TSC, Classical Field Theory and General Relativity, Quantum Many-Body Physics, and basic notions in RG, Soft Condensed Matter, String Theory and AdS/CMT, Topological Orders; Mathematical Analysis, Differential Geometry, Operator Theory, Functional Calculus, Group Theory; Numerical Exact-Diagonalization and etc.



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EDUCATION

- 2009 – Now **Bachelor of Science**
PHYSICS, expected July 2013
Beijing Normal University
- 2008 – 2009 Previous Study
BIOLOGY, at College of Life-Science
Beijing Normal University
- GPA^a 3.6/4 with 2 full scores

ACADEMIC ACTIVITIES

Attended workshops and lectures

- Tsinghua, April, 2012 Serial lectures *Quantum Many-Body Correlation Functions and Applications to BEC* by Professor ALEXANDER FETTER and volunteered to write the lecture notes.
- Tsinghua, April, 2012 Serial lectures on *Superfluidity* by Professor GORDON BAYM.
- CAS, May, 2012 *The Interplay between Magnetism, Superconductivity and Spin-Orbit Coupling in Topological Insulators* by Professor TAYLOR HUGHES.
- KITPC, Summer, 2012 *Critical behavior of lattice models in atomic and molecular, condensed matter and particle*, organized by Professor XIAO-GANG WEN, *et al.*

My talks and presentations

- KITPC, Summer, 2012 Hosted an informal discussion session about topics in *topological insulators with interactions*, under kind permission and instructions of Professor XIAO-GANG WEN
- Junior A blackboard talk on dual gauge theory and dual superconductivity at Professor SU-PENG KOU's group meeting.
- Sophomore Delivered a concise presentation on the generalization of the second law to the realm of non-equilibrium thermodynamics during the course *Introduction to Biological Physics*

^aExcluding ideology-based courses