



## Weekly Seminar

### Rotated Heisenberg Model

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**Time: 4:00pm, 20 May, 2015 (Wednesday)**

**时间: 2015年5月20日 (周三) 下午4:00**

**Venue: Room W563, Physics Building, Peking University**

**地点: 北京大学物理楼 西563**

#### Abstract

Rotated Heisenberg model is a new class of quantum spin models to describe quantum magnetisms in systems with strong spin-orbit coupling (SOC). It originates from the strong coupling limit of interacting fermions of spinor bosons at integer fillings in a lattice in the presence of a SOC. In this talk, we focus on Rotated Ferromagnetic Heisenberg model (RFHM). We introduce Wilson loops to characterize frustrations and gauge equivalent class. For a special equivalent class, we identify a new spin-orbital entangled commensurate ground state. It supports not only commensurate magnons, but also a new gapped elementary excitation: in-commensurate magnons with two gap minima continuously tuned by the SOC strength. When applying a Zeeman field to the RFH, we find that the condensations of the in-commensurate magnons lead to rich and new quantum phases through new universality class of quantum phase transitions. These quantum phases include two collinear states at low and high Zeeman field, two co-planar canted states at two dual related SOC strengths respectively, also a non-coplanar incommensurate Skyrmion (IC-SkX) crystal phases surrounded by the 4 phases. We also explore new universality classes of quantum phase transitions between (among) these phases and finite temperature transitions above all these phases. Experimental implementations and detections of these new phenomena are discussed. Rotated Antiferromagnetic Heisenberg model (RAFHM) will also be briefly discussed. Possible implications to condensed matter systems with or without SOC are given.

#### About the Speaker

叶锦武教授是美国耶鲁大学物理博士。他现在是首都师范大学长江学者教授和美国密西西比州立大学教授。叶教授主要研究领域是强相互作用的电子, 玻色子, 自旋, 光子等的合作现象和量子或拓扑相变理论, 也喜欢研究中国人民解放军的历史, 特别是开国战神粟裕战略和战术对自然科学的指导作用。