



Weekly Seminar

Space-time crystal in trapped ions

Zhang-qi Yin
Tsinghua University

Time: 4:00 pm, Sept.4, 2013 (Wednesday)

时间: 2013年9月4日 (周三) 下午 4:00

Venue: Conference Room A (607), No. 5 Science Building

地点: 理科五号楼607会议室

Abstract

Spontaneous symmetry breaking can lead to the formation of time crystals, as well as spatial crystals. Here we propose a space-time crystal of trapped ions and a method to realize it experimentally by confining ions in a ring-shaped trapping potential with a static magnetic field. The ions spontaneously form a spatial ring crystal due to Coulomb repulsion. This ion crystal can rotate persistently at the lowest quantum energy state in magnetic fields with fractional fluxes. The persistent rotation of trapped ions produces the temporal order, leading to the formation of a space-time crystal. We show that these space-time crystals are robust for direct experimental observation. We also study the effects of finite temperatures on the persistent rotation. The proposed space-time crystals of trapped ions provide a new dimension for exploring many-body physics and emerging properties of matter. Finally, I will briefly discussed the recent debate on time crystal.

About the Speaker

Zhang-qi Yin is an assistant research fellow in Center for Quantum Information, IIS, Tsinghua University. He got PhD in 2009 from XJTU. From Sep. 2007 to Sep. 2009, he was a visiting student in Physics Department, University of Michigan. He was an assistant research fellow in WIPM from Jan. to Jul. in 2010. From Sep. 2010 to 2012, he was a postdoc research fellow in Quantum information laboratory, USTC. Dr. Yin's research focuses on the implementation of quantum information processes in quantum optical systems, such as cavity QED, opto-mechanical systems, NV centers.