IBS CINAP Seminar

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Quantum Magnetism in One Dimension

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Abstract

One-dimensional (1D) quantum spin models are a unique testbed for quantitative understanding of many-body physics. These toy-like models are often realised in real-world materials of quasi-1D magnetic insulators where magnetic exchange interactions are predominant along one particular direction. Their understanding builds on close comparisons between theoretical and experimental results, which is a challenge in most other cases. Examples include studies of a formation of the canonical 1D quantum phase of Tomonaga-Luttinger liquid and the associated classical and quantum critical behaviour. Following a brief introduction to the field of quantum magnetism as well as my own research activities, I will illustrate how to realise experimentally a Tomonaga-Luttinger liquid in a spin ‘ladder’ material. I will show that varying an applied magnetic field strength serves to control the Tomonaga-Luttinger liquid physics. If time allows, I will demonstrate quantum-critical scaling behaviour of a spin ‘chain’ material around the field-induced zero-temperature quantum phase transition.

Brief Biography

Dr. Mingee Chung received PhD in Condensed Matter Physics from KAIST, Korea in 2009. After obtaining PhD, he moved to France, first in Orsay (Univ. Paris-Sud 11) and then Grenoble (LNCMI; National High Magnetic Field Lab.), for postdoctoral research. Since 2014 he continued research at EPFL, Switzerland, until joining the University of Birmingham in 2017 as Birmingham Fellow.
He is currently Lecturer and Birmingham Fellow in the Condensed Matter Physics group, University of Birmingham. His research focuses on collective quantum phenomena such as the emergence of Tomonaga-Luttinger liquid, Bose-Einstein condensate and spin liquid in materials. In particular, he investigate the role of dimensionality, geometry and symmetry in quantum spin systems and zero-temperature phase transitions.

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