

ICTS Skype Seminar

Title : High-field torque response as evidence for strong ferromagnetic Kitaev correlations in the alkali Iridate Na_2IrO_3

Speaker : Sarbajaya Kundu, Tata Institute of Fundamental Research, Mumbai

Date : Thursday, January 10, 2019

Time : 10:00 AM

Venue : Nambu Discussion Room (Left), ICTS Campus, Bangalore

Abstract : The alkali Iridates A_2IrO_3 ($\text{A}=\text{Na}, \text{Li}$) and their celebrated 4d analogue $\alpha\text{-RuCl}_3$ are popular candidate materials for the realization of the physics of the honeycomb Kitaev model.

These systems are described by effective spin models with dominant Kitaev and subdominant Heisenberg interactions, possibly accompanied by further-neighbor Heisenberg or anisotropic interactions. Despite the immense progress made in the understanding of these systems, the sign of the dominant Kitaev interaction, which determines the class of effective spin models relevant for describing them, remains an open question.

We investigate the magnetization response of Na_2IrO_3 for magnetic fields up to 60 Tesla, and find a robust peak-dip feature at fields corresponding to the zigzag ordering temperature (around 15 K). We show using exact diagonalization calculations that such a distinctive signature enables us to constrain the effective spin models describing Na_2IrO_3 to those with a dominant ferromagnetic Kitaev interaction. We further show that the spin-spin correlation functions become very short-ranged as the field exceeds the zigzag ordering scale, indicating a possible field-induced transition to the quantum spin liquid state, similar to the one suggested in $\alpha\text{-RuCl}_3$. Our studies illustrate the underlying universalities of the Kitaev materials Na_2IrO_3 and $\alpha\text{-RuCl}_3$, with the peak-dip feature having been experimentally observed in the latter system recently.