

ICTS Seminar

Title : On controlled generation of emergent magnetic states in artificial spin ice systems

Speaker : Pintu Das, Indian Institute of Technology Delhi

Date : Thursday, September 26, 2019

Time : 3:00 PM

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

Abstract : Artificial spin ice structures (ASI) have attracted great attention, serving as potential analogues for frustrated magnetic systems –such as bulk spin ice materials [1]. In 2008, Castelnovo et al. realized that excitations above the degenerate ground state created by switching of a nanomagnet in a spinice vertex could be interpreted as emergent quasiparticles that behave like magnetic monopoles [2,3].

In this work, we discuss detailed investigations of magnetic switching behavior in individual vertices of square-ASI system composed of lithographically patterned nanoislands of dimensions $300 \times 100 \times 30$ nm³ of Ni₈₀Fe₂₀. We demonstrate the possibility of controlled generation of an emergent magnetic monopole-like state in an isolated square ASI vertex. The interplay of defects and dipolar interactions appears to play a key role in determining the switchings of individual nanomagnets which can be used to create different emergent magnetic states at the ASI vertices.

[1] C. Nisoli, et al., Rev. Mod. Phys. 85, 1473 (2013).

[2] C. Castelnovo, et al., Nature 451, 42 (2008).

[3] A. Farhan, et al., Science Advances 5, eaav6380 (2019).