

BOSE COLLOQUIUM

(Through Webinar)

Date
11 December, 2020



Time
4.00 PM (IST)



Speaker

Pratap Raychaudhuri

Professor (H)

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Meeting Link

Title of the talk : **Observation of Hexatic vortex fluid in a superconducting thin film**

Abstract

In 1969, working on a theoretical problem out of pure mathematical curiosity, David Thouless stumbled upon a new kind of phase transition, across which physical properties show abrupt change but the free energy varies smoothly. Very soon, Michael Kosterlitz and David Thouless realised that this kind of phase transition could be ubiquitous across 2-dimensional (2D) systems. For the particular case of a 2-dimensional crystalline solid, the (Berezinski)-Kosterlitz-Thouless (BKT) theory predicts that the solid melts via a novel intermediate state, called the hexatic fluid, which possesses the orientational order of a solid but the flow properties of a fluid. Recently, using a combination of real space imaging and transport measurements we unraveled the hexatic vortex fluid state in a thin film of the amorphous superconductor, MoGe [1]. In this talk I will discuss the properties of this hexatic vortex fluid and also discuss some very peculiar features of the vortex states revealed from STS and transport measurements [2,3,4].

1. Melting of the Vortex Lattice through Intermediate Hexatic Fluid in an a-MoGe Thin Film, Indranil Roy, Surajit Dutta, Aditya N. Roy Choudhury, Somak Basistha, Iliaria Maccari, Soumyajit Mandal, John Jesudasan, Vivas Bagwe, Claudio Castellani, Lara Benfatto, and Pratap Raychaudhuri, Phys. Rev. Lett., 122, 047001 (2019).
2. Extreme sensitivity of the vortex state in a-MoGe films to radio-frequency electromagnetic perturbation, Surajit Dutta, Indranil Roy, Soumyajit Mandal, John Jesudasan, Vivas Bagwe, and Pratap Raychaudhuri, Phys. Rev. B, 100, 214518 (2019).
3. An inertial model of vortices to explain the extreme sensitivity of hexatic vortex fluid to low frequency ac excitation, Surajit Dutta and Pratap Raychaudhuri, Physica C, 578, 1353740 (2020).
4. Collective flux pinning in hexatic vortex fluid in a-MoGe thin film, Surajit Dutta, Indranil Roy, Somak Basistha, Soumyajit Mandal, John Jesudasan, Vivas Bagwe and Pratap Raychaudhuri, J. Phys.: Condens. Matter, 32, 075601 (2020).

Organized as part of Golden Jubilee Celebration of Department of Science and Technology (DST)

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