SFB/TRR 21 - Seminar

13. Januar 2015, Stuttgart


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## Understanding the static and dynamic Berezinskii-Kosterlitz-Thouless vortex fluctuations in thin films near the superconductor-insulator transition


The experimental advances made in the last decade in the investigation of superconducting phenomena in low-dimensional correlated electronic systems raised new questions on the nature of the Beresinskii-Kosterlitz-Thouless (BKT) transition in quasi-two-dimensional superconductors. Here I will review recent theoretical[1] and experimental[2,3] work for the occurrence of BKT transition in two-dimensional (2D) disordered NbN films with disorder level close to a superconductor-insulator transition (SIT). By properly taking into account the deviations of the vortex-core energy value from its XY-model prediction we can show that the BKT superfluid-density jump is robust even near this 2D disorder-tuned quantum critical point (QCP). At the same time, the dissipation peak around Tc measured by the real part of the optical conductivity gives crucial informations on the vortex dynamics, leading to unexpected slowing down of vortex diffusion in disordered thin films [4]. All these results are discussed in connection to the emergent inhomogeneity of the superconducting properties near the SIT, evidenced by recent STM experiments.



[1] L.Benfatto, C.Castellani and T.Giamarchi, Chapter contribution for the book,"Berezinskii-Kosterlitz-Thouless Transition", Edited by Jorge V. José, World Scientific (2013); arXiv:1201.2307.

[2] Mintu Mondal, Sanjeev Kumar, Madhavi Chand, Anand Kamlapure, Garima Saraswat, G. Seibold, L. Benfatto, Pratap Raychaudhuri, Phys. Rev. Lett. 107, 217003 (2011).

[3] Jie Yong, T. Lemberger, L. Benfatto, K. Ilin, M. Siegel, Phys. Rev. B 87, 184505 (2013).

[4] Rini Ganguly, Dipanjan Chaudhuri, Pratap Raychaudhuri, Lara Benfatto, arXiv:1412.3636.


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