

Abstract Submitted  
for the MAR08 Meeting of  
The American Physical Society

**Signatures of Kosterlitz-Thouless behavior in the superfluid density of anisotropic layered superconductors** LARA BENFATTO, Centro Fermi and University of Rome “La Sapienza”, CLAUDIO CASTELLANI, University of Rome “La Sapienza”, THIERRY GIAMARCHI, University of Geneva — In quasi-two-dimensional (2D) systems, as thin films of  $^4\text{He}$  or of superconductors, the superfluid transition is expected to be driven by phase fluctuations, according to the Kosterlitz and Thouless (KT) theory. However, signatures of KT vortex-antivortex phase fluctuations should be observable, at some energy scale  $T_d$ , also in strongly anisotropic layered superconductors, where quasi-2D behavior arises due to a small Josephson coupling between neighboring planes. While in the 2D case  $T_d$  is uniquely identified by the KT temperature  $T_{KT}$  where the universal jump of the superfluid density is observed, in the layered case such universality is lost. Here we show this effect by means of a renormalization-group analysis of a layered version of the sine-Gordon model, appropriate to describe the occurrence of KT physics in layered superconductors. We find that in the presence of a finite interlayer coupling  $T_d$  is controlled by the vortex-core energy, and can be significantly larger than the 2D scale  $T_{KT}$ . When applied to the superfluid-density behavior in cuprate superconductors these results allows us to determine a non-trivial behavior of the vortex-core energy in these systems. L.Benfatto, C.Castellani and T.Giamarchi, Phys. Rev. Lett. 98, 117008 (2007)

Lara Benfatto  
Centro Fermi and University of Rome “La Sapienza”

Date submitted: 02 Dec 2007

Electronic form version 1.4