Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Nematic quantum phase transition of composite Fermi liquids in half-filled Landau levels and their geometric response YIZHI YOU, University of Illinois at UrbanaChampaign, GIL YOUNG CHO, Korea Advanced Institute of Science and Technology, EDUARDO FRADKIN, University of Illinois at UrbanaChampaign — We present a theory of isotropic-nematic quantum phase transition in the composite Fermi liquid arising in the half-filled Landau levels. We show that the quantum phase transition is triggered by the attractive quadrupolar interaction. By performing flux attachment, system turns into a composite Fermi liquid. The nematic order parameters act as the dynamical metric interplaying with the underlying topology, the Chern-Simons theory. Here both the fluctuations of the gauge field and the nematic order parameter can soften the Fermi surface and thus the fermions form a non-Fermi liquid. The effective field theory for the isotropic-nematic phase transition has z = 3 dynamical exponent due to the Landau damping due to the finite density of the fermions. We show that there is a Berry phase term of the nematic order parameter, which can be interpreted as the Hall viscosity of the dynamical metric. We also find the Wen-Zee-like term, which effectively dresses the nematic vortex with the electric charge. Both of the terms are originated from the time reversal breaking fluctuation of the Chern-Simons gauge fields. This indicates the fluctuations of the gauge fields modify the Hall viscosity and orbital spin of the compressible half-filled Landau level.

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Date submitted: 30 Oct 2015 Electronic form version 1.4