Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Theory of quantum Hall nematic phases[1] YIZHI YOU, GIL YOUNG CHO, EDUARDO FRADKIN, Department of Physics and ICMT, University of Illinois — Motivated by the experiments by Xia et al, we derive and study the effective field theories of isotropic-nematic quantum phase transitions of Chern insulators and FQH states. In both cases, we demonstrate that the low-energy theory of nematic order parameter has z=2 dynamics due to a Berry phase term of the nematic order, which is related with the Hall viscosity in parity and TRS broken states. We present a composite fermion theory for a FQH fluid with attractive quadrupolar interactions which, if strong enough, trigger a transition to a nematic phase. By investigating the excitation spectrum at RPA level, we demonstrate that at the quantum phase transition the energy gap of Girvin-MacDonald-Plazman mode condenses at zero momentum. The topological nature of the fluid is not affected by the transition, the Laughlin quasiparticles remain gapped, the Kohn mode gap is unaffected, and Kohn's theorem is satisfied. In the nematic phase, the nematic order parameter can be regarded as a deformation of the local geometry and couples as a metric to the Maxwell terms of the gauge fields. The vortex of the nematic field, a disinclination, will also be mentioned. We discuss the relation of our results with those of Mulligan et al, and Maciejko et al.

[1]This work was supported in part by the grant NSF DMR 1064319.

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Date submitted: 14 Nov 2013 Electronic form version 1.4