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Theory of Nematic Fractional Filled Landau Levels[1] YIZHI YOU, GIL YOUNG CHO, EDUARDO FRADKIN, University of Illinois at Urbana-Champaign — We present a theory of nematic phase transition in fractional quantum Hall fluids where nematicity acts as a dynamical metric degree of freedom which interplays with the underlying topological phase. The nematic FQH states of a 2DEG arise as an instability triggered by attractive quadrupolar interaction. The effective field theory for the isotropic-nematic phase transition in FQHE has z = 2 dynamical exponent. This is due to a Berry phase term of the nematic order parameter, which is related (but not equal) to the non-dissipative Hall viscosity. The spectrum of collective excitation indicates that the mass gap of GMP mode collapses at the nematic phase transition.The leading coupling between the nematicity and gauge fields has a similar form of Wen-Zee term. A disclination of the nematic order parameter carries a non-quantized electric charge and has non-quantized fractional statistics. We also present similar nematic theory in a half-filled Landau levels. Considering the Chern-Simons gauge fluctuation, the effective mass of the fermion has infrared divergence. Consequently, the effective theory also has a parity-odd Berry phase term which is akin to non-dissipative response. The interplay between the nematic vortex current and Chern-Simons gauge would be displayed.

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