Condensed Matter Theory Center Seminar

Monday, December 9
2:00 – 3:30 pm, Physics Building 2205

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"Quantum Disentangled Liquids"

We propose and explore a new finite temperature phase of translationally invariant multicomponent liquids which we call a "Quantum Disentangled Liquid" (QDL) phase. We contemplate the possibility that in fluids consisting of two (or more) species of indistinguishable quantum particles with a large mass ratio, the light particles might "localize" on the heavy particles. We give a precise, formal definition of this Quantum Disentangled Liquid phase in terms of the finite energy density many-particle wavefunctions, involving partial measurements. If the positions of all the heavy particles are *measured*, the projected wavefunction for the unmeasured light particles has as an area law entanglement entropy, while *measuring* the light particle positions projects onto a heavy particle wavefunction with a volume law entanglement entropy. A heavy/light particle QDL phase can be generalized to include other partial measurements, such as measuring the spin or the charge in a Fermion Hubbard-type model. In a spin/charge QDL phase, measuring the spin in a finite energy density eigenstate would project on to a charge wavefunction with an area law entanglement entropy, while a charge measurement would project on to a volume law entangled spin wavefunction. Possible physical systems that might manifest a QDL phase will be briefly discussed.

(All are welcome to attend)

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