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Towards the detection of a massive collective mode of the attractive Hubbard model: the η mode DEBAYAN MITRA, ELMER GUARDADO-SANCHEZ, PETER BROWN, PETER SCHAUSS, WASEEM BAKR, princeton university — Goldstones theorem states that a system with spontaneously broken continuous symmetries possesses excitations that are massless bosons. A prototypical example is the phonon modes in a crystal which result from the breaking of translational symmetry. At half-filling, the attractive Hubbard model is known to possess not only one SU(2) symmetry, that of the spin, but also another SU(2) symmetry attributed to the "pseudospin". The pseudospin symmetry results in a degeneracy between superfluid and charge-density-wave ordered ground states and there are no massive modes in the excitation spectrum. The symmetry can be explicitly broken by doping the system away from half-filling, leading to the prediction of a massive mode known as the η mode, corresponding to rotations between these orders. In this talk, I will present the theoretical background for understanding this mode and discuss our progress towards its experimental detection, including the generation of traveling wave potentials in a Hubbard system with a spatial light modulator and the phase sensitive detection of charge density oscillations in the system.

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