Abstract Submitted
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Quantitative many-body theory of unitarity BECs MACKILLO KIRA, University of Michigan — Perturbative approaches, such as the Gross-Pitaevskii equation, can successfully explain weak interactions in BECs, while they become questionable at unitarity where the scattering length diverges. The first unitary BEC experiment[1] demonstrated that a surprisingly large BEC fraction survived a quench from weak to unitary interactions. I will show that introducing an excitation picture[2] identifies how a quench creates noncondensed atoms in a strict sequential order[3] where large atom clusters only emerge from existing smaller ones. This observation yields an efficient nonperturbative many-body description of unitary BECs, based on a cluster-expansion approach developed originally for semiconductor quantum optics[4]. I will discuss how this method quantitatively explains[5] the first unitarity BEC measurement, and how it can be extended to explore, e.g., Efimov physics, universality, and entanglement in one or many strongly interacting BECs.

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