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Phase coherence properties of ultracold Bose gas in optical trimerized Kagome lattice[1] TSZ-HIM LEUNG, THOMAS BARTER, MASAYUKI OKANO, University of California, Berkeley, MAXWELL BLOCK, Rigetti Computing, Inc., NORMAN YAO, University of California, Berkeley, DAN STAMPER-KURN, University of California, Berkeley and Materials Sciences Division, Lawrence Berkeley National Laboratory — The trimerized (breathing) Kagome lattice, which can be seen as a triangular lattice of trimers, has attracted significant theoretical interests in recent years. This lattice is an extension of the normal Kagome lattice that it has different intra- (J) and inter-trimer (J') tunneling, leading to a richer spatial structure and possibility to host novel quantum states. We report the experimental realization of the Bose-Hubbard model in an optical trimerized Kagome lattice with ^{87}Rb atoms and optical superlattice techniques, with the capability of independently tuning the inter- and intra-trimer tunneling, as well as the relative offsets in a trimer. By studying time-of flight images, we measure the coherence of the system as it crosses the superfluid to Mott insulator transition and show that short-range coherence within trimers could persist in certain parameter regimes. We make comparisons and show a clear difference between the trimerized Kagome lattice and the normal Kagome lattice. Furthermore, we modify the local wavefunction in a trimer using phase imprinting techniques and show asymmetric diffraction patterns, revealing asymmetric correlations in the system.

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Tsz-Him Leung
University of California, Berkeley

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