

Abstract Submitted  
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**Persistent nearest-neighbor coherence of a Mott insulator in a trimerized Kagome lattice**<sup>1</sup> THOMAS BARTER, TSZ-HIM LEUNG, MASAYUKI OKANO, University of California, Berkeley, MAXWELL BLOCK, Rigetti Computing, Inc., Berkeley, CA, NORMAN YAO, DAN STAMPER-KURN, University of California, Berkeley — Mott insulating states are characterized by the absence of long range phase coherence, whilst short range coherence is typically extinguished as the tunneling is suppressed. We report a persistent nearest-neighbor phase coherence in a two dimensional Mott insulator of ultracold  $^{87}\text{Rb}$  atoms. We realize an optical trimerized Kagome lattice, with strong intra-trimer tunneling and weak inter-trimer tunneling and create a novel Mott insulating state of strongly coupled local orbitals. Evidence for this state comes from interpreting the momentum-space distribution obtained from time of flight. As the inter-trimer tunneling is suppressed, we see a persistent nearest-neighbor coherence. Furthermore we show an asymmetry between the intra-trimer, and inter-trimer coherences by imprinting a phase pattern on the lattice. Finally, we discuss the possibility of engineering insulating states with fractional number and angular momentum.

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