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Spontaneous pattern formation in a driven Bose-Einstein Condensate[1] ZHENDONG ZHANG, KAI-XUAN YAO, University of Chicago, LEI FENG, Joint Quantum Institute, JIAZHONG HU, Tsinghua University, CHENG CHIN, University of Chicago — We report, based on momentum and real space pattern recognition, formation of density patterns with two- (D_2), four- (D_4) and six-fold (D_6) symmetries in Bose-Einstein condensates with atomic interactions driven at two frequencies. The symmetry of the pattern is controlled by the ratio of the frequencies. The D6 density waves, in particular, arise from a resonant wave mixing process that coherently correlates and enhances the excitations that respect the symmetry. Our work provides insight into the origin of pattern formation in quantum systems, while also suggests a new way to generate multi-mode entanglement.

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