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Numerical Simulation of Matter-wave Jets in Driven Bose-Einstein Condensates. HAN FU, James Franck Institute, University of Chicago, LEI FENG, James Franck Institute, Enrico Fermi Institute and Department of Physics, University of Chicago, BRANDON ANDERSON, James Franck Institute, University of Chicago, LOGAN CLARK, JIAZHONG HU, James Franck Institute, Enrico Fermi Institute and Department of Physics, University of Chicago, JEFFERY ANDRADE, Harvard University, CHENG CHIN, James Franck Institute, Enrico Fermi Institute and Department of Physics, University of Chicago, KATHRYN LEVIN, James Franck Institute, University of Chicago — Recent experimental work by Clark et al. in Nature 551, 356 (2017) reported a collective emission of matter-wave jets in a modulated bosonic condensate. Here the inter-atomic interactions are time-dependent because of the oscillating magnetic field. We use time dependent Gross-Pitaevskii theory to simulate these experiments and demonstrate good agreement with the data under experimental conditions. Despite the rather violent emission of matter-wave jets, there is considerable systematics in the underlying behavior. Of interest is the observation of a sequence of rings in momentum space with radii following the power law as $N^{1/2}$, where $N = 1, 2, 3\ldots$ is the order of the ring. We characterize the angular correlation functions g^2 and g^3 of the emitted atoms and show that both compare favorably with experiment. We extract phase information from our simulations to provide further insights into the quantum coherence of the stimulated processes. We end by addressing how this simple dynamical condensate theory can capture the essential features of matter-wave jets.

Han Fu
James Franck Institute, University of Chicago

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