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Period-doubling Instability of a Bose-Einstein Condensate in a Periodically Translated Optical Lattice NATE GEMELKE, EDINA SARAJLIC, YANNICK BIDEL, SEOKCHAN HONG, Stanford University, STEVEN CHU, Lawrence Berkeley National Lab — We observe dynamical instability of a Bose-Einstein condensate in a periodically translated optical lattice, which results in transient period-doubling of the zero momentum condensate wavefunction. The onset of instability is marked by the sudden growth of peaks at half the lattice recoil momentum in the atomic interference pattern of the released condensate. The effect is attributed to band shaping, introduced by modulation of the optical lattice potential, and breaking of translational symmetry by interparticle interaction. The threshold conditions for instability are successfully predicted by the Gross- Pitaevskii equation, in combination with simple arguments for the single-particle band shape. We connect this onset with the destructive interference of nearest-neighbor tunnelling amplitudes in the two lowest bands.

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