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Parametric excitation of a Bose-Einstein condensate with modulated interactions[1] DE LUO, JASON H. V. NGUYEN, PATRICK BAGGE, RANDALL G. HULET, Department of Physics and Astronomy, Rice University, Houston, TX 77005 — Faraday waves are standing wave patterns that appear on the surface of a periodically driven medium. They have been observed in a Bose-Einstein condensate (BEC) by modulating the trapping potential[2]. In this work, we explore the Faraday wave phenomenon in a quasi-1D BEC by modulating the atomic interaction. We create a ^{7}Li BEC in the $|1,1\rangle$ state and modulate the scattering length directly by the Feshbach resonance. We have observed two very different regimes. When the modulation frequency is comparable to the radial trapping frequency and the modulation amplitude is small, we observe the Faraday waves. Their spatial frequency as a function of the modulation frequency and amplitude is in good agreement with mean-field theory. On the other hand, when the modulation frequency is much smaller than the radial trap frequency, the condensate evolves into a granulated state, where grains of atoms form with varying sizes. We find that the granulation is incompatible with mean-field theory, but is well-described by a beyond mean-field approach, which hints that the granulation is concurrent with many-body correlations.

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[2]P. Engels, C. Atherton, and M. A. Hoefer, Phys. Rev. Lett. 98, 095301 (2007).

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