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Novel Commensurability Effects and Enhanced Pinning at Nonmatching Fields for Vortices Interacting with Diluted Periodic Pinning Arrays CHARLES REICHHARDT, CYNTHIA J. OLSON REICHHARDT, Theoretical Division, Los Alamos National Laboratory — Using numerical simulations, we demonstrate that periodic pinning arrays that have been diluted by removing some fraction of the pinning sites at random have pronounced commensurability effects at the *same* field strength as undiluted pinning arrays. The commensuration can occur at fields significantly higher than the field corresponding to one-to-one matching between the diluted pinning array and the vortices, and the effect persists for periodic arrays with up to 90 percent dilution. We show that samples with diluted periodic pinning arrays produce a considerable enhancement of the critical current for fields above the first matching field compared to samples with purely random pinning arrangements. These results suggest that diluted periodic pinning arrays may be a promising geometry to increase the critical current in superconductors over a wide magnetic field range.

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