Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Strong pinning regimes explored with large-scale Ginzburg-Landau simulations[1] ROLAND WILLA, ALEXEI E. KOSHELEV, Argonne National Laboratory — Improving the current-carrying capability of superconductors requires a deep understanding of vortex pinning. Within the theory of (3D) strong pinning [1] an ideal vortex lattice is weakly deformed by a low density n_p of strong defects. In this limit the critical current j_c is expected to grow linearly with n_p and to decrease with the field B according to $B^{-\alpha}$ with $\alpha \approx 0.5$. In the small-field limit the (1D) strong pinning theory of isolated vortices predicts $j_c \propto n_p^{0.5}$, independent of B. We explore strong pinning by low defect densities using time-dependent Ginzburg-Landau simulations [2]. Our numerical results suggest the existence of a wide regime, where the lattice order is destroyed and yet interactions between vortices are important. In particular, for large defects we found an extended range of power-law decay of $j_c(B)$ with $\alpha \approx 0.3$, smaller than predicted. This regime requires the development of new analytical models. Exploring the behavior of j_c for various defect densities and sizes, we will establish pinning regimes and applicability limits of the conventional theory. [1] G. Blatter *et al.*, Phys. Rev. Lett. **92**, 067009 (2004) [2] I. A. Sadovskyy *et al.*, J. Comput. Phys. **294**, 639 (2015)

[1]This work is supported by the U.S. Department of Energy, Office of Science, Materials Sciences and Engineering Division. R. W. acknowledges support from the Swiss National Science Foundation through the SNSF Early Postdoc Mobility Fellowship.

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Date submitted: 10 Nov 2016 Electronic form version 1.4