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Improved critical current in confined superconductors in parallel field configuration[1] ANDREAS GLATZ, IGOR ARONSON, YONGLEI WANG, ZHILI XIAO, Argonne National Laboratory — We present results on the re-entrance of the superconducting state in systems placed into a magnetic field parallel to the applied current. In experiments it was observed that the magneto-resistance first increases with magnetic field, but at higher field drops again such that superconductivity is recovered. This effect is strongly temperature dependent and can lead to a suppression of resistance below the measurable threshold over a range of a few kG. We study the vortex dynamics and magneto-resistance in this situation in the framework of a large-scale time-dependent Ginzburg Landau simulation. A small external current as well as the magnetic field are applied in the x-direction, the latter is then ramped up. Our simulations reproduce this effect and reveal the mechanism for the observed behavior: the intermediate resistive state is due to a vortex instability leading to an unwinding of twisted vortex configurations. This leads to a periodic dynamic resistive state. When the field increases these instabilities get stabilized due to a higher vortex density and the resistance drops upon increasing the magnetic field.

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Andreas Glatz
Argonne National Laboratory

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