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Critical Current of Layered Superconductor with Columnar Defects in Tilted Magnetic Field: A Numerical Study[1] JOSE RODRIGUEZ, California State University at Los Angeles — The critical current of a layered (a-b plane) superconductor with perpendicular (c-axis) columnar defects in titled external magnetic field is determined by numerical simulations of the corresponding London model for vortex dynamics. Intra-layer vortex dynamics is computed in parallel by central processors units (CPU) assigned to each layer, while inter-layer vortex dynamics is computed by a message passing interface (MPI) between the dedicated CPU's. We find that the critical current versus the angle that the external magnetic field makes with the columnar defects shows a cusp maximum at zero. At fixed tilt angle, we also find that the critical current increases monotonically with increasing electronic mass anisotropy, m_c/m_{ab}, in a manner consistent with collective-pinning theory. Comparison with experimental determinations of the critical current in films of high-temperature superconductors with both natural (line dislocation) and artificial (nano-rod) columnar defects is made where possible.

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