

Abstract Submitted
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Novel commensurability effects in superconducting films with antidot arrays¹ GOLIBJON BERDIYOROV, Department of Physics, University of Antwerp, Belgium, MILORAD MILOSEVIC, Department of Physics, University of Antwerp, Belgium, FRANCOIS PEETERS, Department of Physics, University of Antwerp, Belgium, CONDENSED MATTER THEORY GROUP TEAM — Vortex pinning by arrays of microholes is already a well established tool for enhancing the critical current in superconducting films. The pronounced peaks in $j_c(H)$ characteristics at so-called matching fields are generally attributed to the collective locking of vortices to the pinning sites. However, the issues of symmetry and composition of the resulting vortex lattice are often oversimplified. We investigated in detail the vortex configurations in superconducting films with regular antidot-arrays within the non-linear Ginzburg-Landau theory, where demagnetization effects and overlapping vortex cores are fully taken into account (contrary to the London approach). In addition to the well-known matching phenomena, we predict: (i) the nucleation of giant-vortex states at interstitial sites; (ii) the combination of giant- and multi-vortices at rational matching fields; and (iii) for particular interstitial vorticity, the symmetry imposed creation of vortex-antivortex configurations.

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