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Novel Flux Matching Effects in Potentially Type-I Superconducting Au/Pb Bilayers Patterned with Antidot Lattices[1] LANCE DE LONG, SERGIY KRYUKOV, University of Kentucky, VITALI METLUSHKO, University of Illinois-Chicago — We report AC and DC SQUID magnetometer data for Au(25nm)/Pb(x) bilayers (x = 50, 100 nm) patterned with square antidot (AD) lattices having AD diameter D = 600 nm and AD separation d = 1 micron, in DC magnetic fields applied perpendicular to the film plane. Both AC and DC data for x = 100 nm samples exhibit a "two-horned" magnetization m(H) well below T_C, with small, sharp cusps having DC field spacings near 3 Oe. Just below T_C = 6.2 K, m(H) is highly reversible, and exhibits at least two matching fields H_n = (20 Oe)n. This striking behavior is compared with recent theoretical models for flux matching in patterned films in the Type-I intermediate state, for which formation of "giant vortices" or pinning of normal domains by AD are possible. In contrast, data for x = 50 nm samples exhibit smooth (no small cusps) m(H) behavior with sharp matching peaks and highly irreversible behavior just below T_C, typical of extensively studied, Type-II patterned films.

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