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Enhancement of superconductivity by a parallel magnetic field in 2-D superconductors H.J. GARDNER, L. YU, A. KUMAR, P. XIONG, Physics and MARTECH, Florida State University, M.P. WARUSAWITHANA, O. VAFEK, Physics and NHMFL, Florida State University, D.G. SCHLOM, Materials Science and Engineering, Cornell University — We report on the observation of significant enhancement of superconductivity by an applied *parallel* magnetic field in two different 2-D superconducting systems: ultrathin, homogeneously disordered amorphous Pb films and the 2-D electron gas at the heteroepitaxial interface of 8 u.c. $LaAlO_3$ on TiO_2 terminated $SrTiO_3$. For both systems, we observe that the mean field T_c is increased by a parallel magnetic field, while any perpendicular magnetic field results in a reduction of T_c. In the case of ultrathin *a*-Pb films, the magnitude of the T_c enhancement is studied as the film thickness (zero-field T_c) is varied *in situ*; the T_c enhancement shows a strong non-monotonic dependence on the film thickness, peaking at 13% in 8 T parallel field for a film with zero-field T_c of 2.504 K. A comparison between the enhancement effect observed in ultrathin *a*-Pb films and the $LaAlO_3/SrTiO_3$ interface is presented. We will discuss the possible origin of the parallel magnetic field enhancement of superconductivity in these disparate systems.

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