

Abstract Submitted  
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**Giant enhancement of superconductivity in ultrathin  $\alpha$ -Pb films by a parallel magnetic field: effect of magnetic impurity** ASHWANI KUMAR, H. JEFFREY GARDNER, LIUQI YU, PENG XIONG, Department of Physics and MARTECH, Florida State University — An ultrathin superconductor containing paramagnetic impurities is predicted<sup>1,2</sup> to exhibit *enhancement* of superconductivity ( $T_c$  and  $I_C$ ) when subject to a parallel magnetic field. We have recently observed a pronounced enhancement of superconductivity in ultrathin homogeneous amorphous Pb films without any (intentionally added) magnetic impurities in the presence of a parallel magnetic field; the  $T_c$  enhancement is as large as 13% and persists in field as high as 8 T. Our experiments are carried out in a modified dilution refrigerator capable of *in situ* film growth, sample rotation, and incremental deposition of magnetic (Cr) impurities, which allows for a systematic, unambiguous elucidation of the effect of paramagnetic impurities on the field-enhancement of superconductivity. With increasing Cr density on a Pb film, the magnitude of the  $T_c$  enhancement is progressively suppressed, contrary to the theoretical predictions.<sup>1</sup> Kharitonov *et al.*, JETP Lett. 82, 473 (2005).<sup>2</sup> Wei *et al.*, Europhys. Lett. 75, 943 (2006).

Ashwani Kumar  
Department of Physics and MARTECH, Florida State University

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