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Superconducting Fluctuations and Paraconductivity in Ultrathin a -Pb Films near Superconductor-Insulator Transition¹ HAOYANG LIU, ASHWANI KUMAR, LIUQI YU, PENG XIONG, Florida State University — The Aslamazov-Larkin (AL) equation describes the extra conductance above T_c of a superconductor due to superconducting fluctuations. While agreement with AL model has been found in some conventional 2D superconductors, its applicability in ultrathin limit near the superconductor-insulator transition (SIT) has not been ascertained. Here we report a study of superconducting fluctuation and paraconductivity in ultrathin 2D amorphous Pb films near SIT. The films were incrementally deposited in a dilution refrigerator. Electrical measurements were performed *in situ* at each thickness, resulting in a series of $R(T)$ across the SIT. Paramagnetic impurities (Cr) were then incrementally deposited, driving the film back to SIT and yielding another set of $R(T)$. The two sets of $G(T)$ were fitted to the AL equation with T_c and magnitude of the paraconductivity as fitting parameters. In both cases, as T_c decreases below ~ 2 K, the paraconductivity increases precipitously, reaching more than an order of magnitude higher than the AL prediction. The significant enhancement of superconducting fluctuations near SITs suggests strong emergent electronic inhomogeneities in the uniform 2D amorphous films.

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