"Implications of weak-link behavior on the performance of Mo/Au bilayer transition-edge sensors"

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Abstract: Understanding the physical properties of the superconducting-to-normal transition is fundamental for optimizing the design and performance of transition-edge sensors (TESs). Recent critical current measurements of Mo/Au bilayer test structures show that they act as weak superconducting links, exhibiting oscillatory, Fraunhofer-like behavior with applied magnetic field. In this paper we investigate the implications of this behavior for TES X-ray detectors, under operational bias conditions. These devices include normal metal features used for absorber attachment and unexplained noise suppression, which result in modifications to the previously reported critical current behavior. We present measurements of the logarithmic resistance sensitivity with temperature, a, and current, b, as a function of applied magnetic field and bias point within the resistive transition. Results show that these important device parameters exhibit similar oscillatory behavior with applied magnetic field, which in turn affects the signal responsivity and noise, and hence the energy resolution. These results show the significance of the critical current in determining the performance of TESs and hold promise to improve future.