

## **Anomalous magnetic diffraction of Bi<sub>2</sub>Sr<sub>2</sub>CaCu<sub>2</sub>O<sub>8</sub>/Ag/Pb SNS' Josephson junctions**

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### **Abstract**

Proximity Josephson junctions have been formed on cleavage steps of Bi<sub>2</sub>Sr<sub>2</sub>CaCu<sub>2</sub>O<sub>8</sub> (BSCCO) single crystals. In-plane, BSCCO/Ag/Pb junctions on such steps show RSJ-type Josephson behavior with supercurrent densities as high as 104 A cm<sup>-2</sup> and an I<sub>c</sub>R<sub>n</sub> product of 5 mV is observed as theoretically predicted for these junctions. However, c-axis, out-of-plane junctions exhibit no measurable Josephson coupling. Instead, a BCS-like gap structure of 25 mV with a nonzero conductance at zero bias is observed for this kind of junctions. Furthermore, magnetic field dependence of the critical current is studied at low temperatures. Magnetic diffraction pattern is anomalous and decays rapidly to zero with magnetic field at around 300 G. Possible explanations for the anomalous diffraction data have been proposed and discussed in detail.

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### **Keywords**

A. high-T<sub>c</sub> superconductors, D. tunneling