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Magnetic Field Dependence of the Critical Current of Planar Geometry Josephson Junctions MENG MA, ETHAN CHO, Univ of California - San Diego, CHUONG HUYNH, Carl Zeiss Microscopy, LLC., SHANE CYBART, ROBERT DYNES, Univ of California - San Diego — We report a study on the magnetic field dependence of the critical current of planar geometry Josephson junctions. We have fabricated Josephson junctions by using a focused helium ion beam to irradiate a narrow barrier in the plane of a 25 nm thick Y–Ba–Cu–O film. The London penetration depth λ_L is large ($\sim$1 μm) because of the ultra–thin thickness of the film. As a result, calculations of the Josephson penetration depth λ_J are not realistic nor physical. Therefore in this work, we measure λ_J experimentally. We tested devices with bridge widths ranging from 4 to 50 μm, and present measurements of the Fraunhofer quantum diffraction pattern ($I_C(B)$). We observe a crossover from short to long junction behavior, which gives an experimentally measured λ_J that ranges between 3 μm to 5 μm. The shape of the $I_C(B)$ pattern is strongly affected by the width of the bridge because of self-field effects. As the bridge width increases, Josephson vortices enter the junction and skew the patterns. This work shows that the electronic properties of the planar junctions are very different than those classical "sandwich" junctions due to the differences in geometry.

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