Investigation of Vortex Pinning Anisotropy in the High Temperature Superconductor YBa$_2$Cu$_3$O$_{7-\delta}$

ANDRA PETREAN-TRONCALLI, Austin College, LISA PAULIUS, Western Michigan University, HEATHER QUANTZ, Austin College, VALENTINA TOBOS, Lawrence Technological University, WAI-K KWOK, Argonne National Laboratory — Columnar defects have proven to be highly effective at pinning vortices, but most studies have been performed with the defects oriented either perpendicular or at large angles relative to the superconducting Cu-O planes. These studies have shown that the intrinsic pinning anisotropy of the crystal can actually be reversed by sufficiently strong columnar defects oriented perpendicular to the Cu-O planes. We have preliminary data that indicate that the pinning anisotropy is actually enhanced for columnar defects introduced parallel to the superconducting Cu-O planes. A single crystal of YBa$_2$Cu$_3$O$_{7-\delta}$ was polished down to a narrow width of 27 $\mu$m, allowing heavy ions to penetrate the crystal along the ab-plane. The crystal was irradiated with 1.4 GeV $^{208}$Pb$^{56+}$ ions to a dose matching field of 1T.

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