Chez Pierre

Presents ...

Tuesday, October 19, 2021

12:00pm Noon

Special Chez Pierre Seminar

Philip Kim – Harvard University

"Toward realization of novel superconductivity based on twisted van der Waals Josephson junction in cuprates."

Twisted interfaces between stacked van der Waals cuprate crystals enable tunable Josephson coupling, utilizing anisotropic superconducting order parameters. Employing a novel cryogenic assembly technique, we fabricate high-temperature Josephson junctions with an atomically sharp twisted interface between Bi$_2$Sr$_2$CaCu$_2$O$_{8+x}$ crystals. The critical current density J_c sensitively depends on the twist angle. While near 0° twist, J_c nearly matches that of intrinsic junctions, it is suppressed almost 2-orders of magnitude but remained finite near 45°. J_c also exhibits non-monotonic behavior \textit{vs} temperature due to competition between two supercurrent contributions from nodal and anti-nodal regions of the Fermi surface. Near 45° twist angle, we observe two-period Fraunhofer interference patterns and fractional Shapiro steps at half integer values, a signature of co-tunneling Cooper pairs necessary for high temperature topological superconductivity.