Non-Fermi liquid transport phenomena in SrIrO$_3$ thin films: Role of disorder in a nematic phase

KYOUNG-MIN KIM, KI-SEOK KIM, POSTECH — Recently, non-Fermi liquid transport phenomena have been found in SrIrO$_3$ thin films on various substrates: Increasing the lattice mismatch between SrIrO$_3$ thin films and substrates, the exponent $\alpha$ of electrical resistivity $\Delta \rho \sim T^{\alpha}$ shows the variation from $\alpha = 4/5$, $\alpha = 1$, to $\alpha = 3/2$. Such experiments confirmed that these thin films lie away from a magnetic quantum critical point. On the other hand, we suggest that the presence of strong spin orbit coupling may give rise to an electron nematic phase. As a result of combined effects between quantum criticality of electron nematicity and nonmagnetic quenched disorders, we suspect that the continuous evolution of the power-law exponent may be involved with quantum Griffiths effects. Performing the renormalization group analysis, we discuss a possible origin of this non-Fermi liquid physics.

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