Emergent quantum transport due to quenched magnetic impurity scattering by antiferromagnetic proximity in $SrCuO_2/SrIrO_3$

Debakanta Samal
Institute of Physics, Bhubaneswar, Odisha, India
E-mail: dsamal@iopb.res.in

Gaining control over electron scattering in complex materials is a critical step to advance the understanding that can have technological implication. Through an antiferromagnetic proximity effect, we observe an enhanced effective phase coherence length (l_φ) in a spin-orbit coupled semimetal $SrIrO_3$ (which is predicted to host 3D Dirac quasiparticles near the Fermi energy) from quantum interference originated magnetoconductance study. The above effect is discussed in view of quenching of magnetic impurity scattering which originates from spin Andreev reflection at antiferromagnet ($SrCuO_2$)/$SrIrO_3$ interface. More importantly, we observe chiral anomaly induced topological electron transport in longitudinal magnetoconductance (B∥E) for the $SrCuO_2/SrIrO_3$ bilayer which is absent in bare $SrIrO_3$ film. Compared to the results on bare $SrIrO_3$ film, antiferromagnetic proximity effect in $SrCuO_2/SrIrO_3$ unfolds a practical means to circumvent the detrimental effect of unintended magnetic impurity scattering and preserve topological electron transport in $SrIrO_3$.

Reference

[1] Subhadip Jana, T. Senapati, Shwetha G. Bhat, S. N. Sarangi, K Senapati and D. Samal, Phys. Rev. B 107, 134415 (2023)