Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally Mandal, Ranga Reddy Dist., Hyderabad – 500 046

Seminar

Visualising Superconductivity Mediated by Nematic Fluctuations in the Fe-Based Superconductor $FeSe_{1-x}S_x$

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Superconductivity mediated by nematic fluctuations, although well-established theoretically, has yet to be unambiguously identified experimentally. A major challenge is that nematicity is often intertwined with other degrees of freedom, such as magnetism and charge order. The $FeSe_{1-x}S_x$ family of iron-based superconductors provides a unique opportunity to explore this concept, as it features an isolated nematic phase that can be suppressed by sulphur substitution at a quantum critical point (QCP) near $x_c = 0.17$, where nematic fluctuations are the largest. Here, we performed scanning tunnelling spectroscopy measurements to visualise Bogoliubov quasiparticle interference patterns, from which we determined the momentum structure of the superconducting gap near the Brillouin zone Γ point of $FeSe_{0.81}S_{0.19}$. The results reveal an anisotropic, near-nodal gap with minima rotated by 45° relative to the Fe–Fe direction, consistent with a nematic pairing interaction. In contrast, these are the directions along which the superconducting gap of pristine FeSe is maximal. Therefore, the measured gap structure indicates a fundamental change in the pairing mechanism across the $FeSe_{1-x}S_x$ phase diagram and provides evidence for superconductivity mediated by nematic fluctuations in $FeSe_{0.81}S_{0.19}$.

Wednesday, Nov 11th 2026

16:00 Hrs (Tea / Coffee 15:45 Hrs)

Seminar Hall, TIFRH