Quasiparticle Interference Patterns of Ising Superconductor Monolayer $NbSe_2$ with Rashba Spin-Orbit Coupling

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Abstract. The layered bulk superconductor based on transition metal dichalcogenides of the $NbSe_2$ family have variety of unconventional superconductivity [1-3]. They exhibit a special form of non-conventional superconductivity with Ising order pairing mechanism [4] with an exceptional consequence of protecting the superconductivity in high upper critical magnetic field parallel to the $NbSe_2$ layer [5]. In the talk we discuss electronic structure of $NbSe_2$ monolayer on the substrate modelled by single-band model with C_{3v} symmetry. We present possible types of superconducting pairing functions and their manifestation in quasiparticle interference patterns considering a scalar impurity using T-matrix approach [6]. For the electronic structure calculations, we employ a tight-binding model with Rashba spin-orbit coupling fitted to the first-principles calculations.

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[1] X. Xi *et al*., Nature Physics **12**, 139 (2016).
[2] A.Devarakonda *et al*., Science **370**, 6513 (2020)
[3] H. Zhang *et al*., Nature Physics **18**, 1425-1430 (2022)
[4] T.Samuely *et al*., arXiv:2304.03074
[5] P. Szabó *et al*., Phys. Rev. Lett. **86**, 5990 (2001).
[6] C. Bena, S. A. Kivelson, Phys. Rev. B **72** 125432 (2005).