UNIVERSITÄT DUISBURG ESSEN

Offen im Denken

Theorie-Kolloquium SS 2022
Fr 06.05.2022, 14:00-15:30
MC 351 & online (URL in E-Mail)

udue.de/TheoKoll

Magnetic Skyrmions Induce Topological Superconductivity

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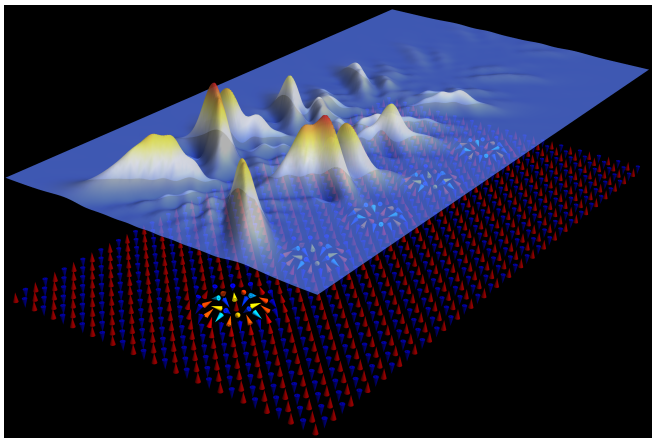
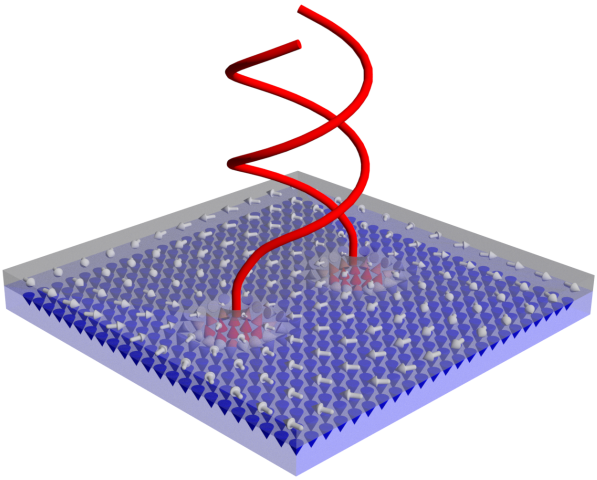
UDE



Antiferromagnetic skyrmion chains induce Majorana bound states.



Braiding Majorana bound states using skyrmion-vortex pairs.

The hallmark signatures of topological superconductors are Majorana bound states, zero-energy excitations whose non-abelian exchange statistics makes them attractive building blocks for topological quantum computing. Despite considerable experimental progress in realizing and detecting Majorana bound states, conclusive evidence of their non-abelian exchange statistics is lacking. Recently, magnet-superconductor heterostructures have been considered as systems to induce topological superconductivity. When magnetic skyrmions - particle-like, whirling spin configurations - are present in the magnetic layer, new routes to realize Majorana bound states become possible. Majorana bound states emerge at the ends of antiferromagnetic skyrmion chains embedded in a collinear antiferromagnetic background and without the need of an external magnetic field [1]. Majorana bound states are also supported at the core of ferromagnetic skyrmions coupled to superconducting vortices [2], which form the basis of a recently proposed novel and scalable topological quantum computing platform [3].

[1] S. A. Díaz et al., Phys. Rev. B 104, 214501 (2021)
[2] J. Nothhelfer, S. A. Díaz, et al., arXiv:2110.13983
[3] J. Nothhelfer et al., WO2020EP66120 (2019)