

Topological Physics and Device Implementation of Skyrmions

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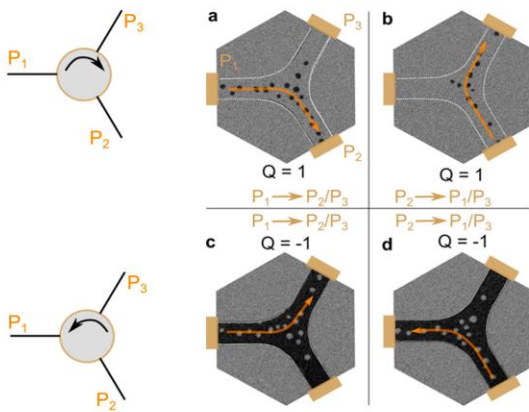
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Magnetic skyrmion is one of the most exciting topics in spintronics, on which many intriguing real-space topological physics and emerging devices concepts have been frequently discussed. In this talk, I will focus on the spin-topology-driven dynamics of skyrmion – the skyrmion Hall effect, in which an accumulation of skyrmions at the transverse side of the device is achieved [1-2]. Towards the device application, a skyrmion circulator by taking the advantage of the skyrmion Hall effect is demonstrated [3]. To reveal the nature of real space spin topology, a Stern-Gerlach-like experiment is conducted, which reveals the topological character of skyrmion resembles more closely like atomic spin, rather than charge [4]. In the second part, I will focus on the skyrmionic device concepts, including the realization of skyrmion racetrack memory and in situ read out of individual nanoscale skyrmions by using tunneling magnetoresistance [5].

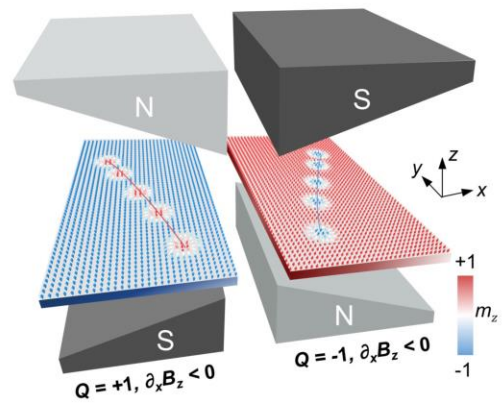
References:

- [1] W. Jiang, et al., *Nature Physics*, 13, 162 (2017).
- [2] Z. Wang, et al., *Physical Review B*, 100, 184426 (2019).
- [3] C. Song, W. Jiang et al., *Nano Letters*, 22, 9836 (2022).
- [4] J. Liu, W. Jiang et al., *Nano Letters*, ASAP, [acs.nanolett.3c00731](https://doi.org/10.1021/acs.nanolett.3c00731) (2023).
- [5] L, Zhao. et al., In preparation (2023).

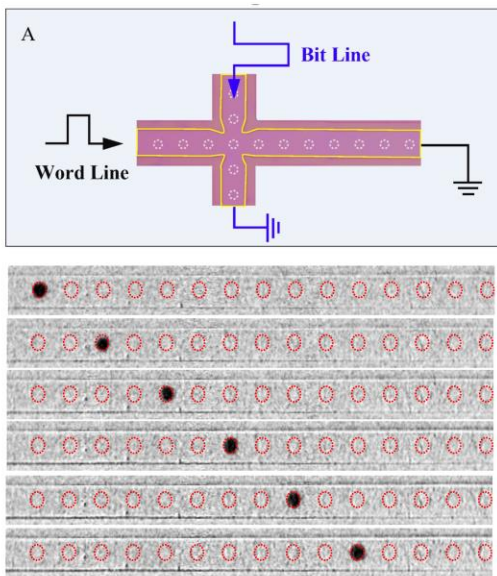
From skyrmion Hall effect to skyrmion circulator



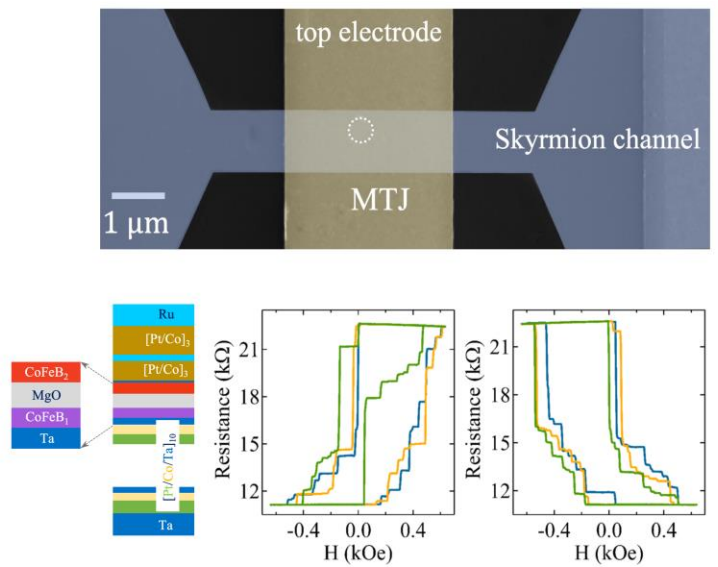
Stern-Gerlach-like experiment for skyrmions



skyrmion shift register



TMR detection of nanoscale skyrmions



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