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Perpendicular reading of single confined magnetic skyrmions[1]
DAX M. CRUM, Peter Grünberg Institut and Institute for Advanced Simulation, Forschungszentrum Jülich and JARA, and The University of Texas at Austin, MOHAMMED BOUHASSOUNE, JUBA BOUAZIZ, BENEDIKT SCHWEFLINGHAUS, STEFAN BLÜGEL, SAMIR LOUNIS, Peter Grünberg Institut and Institute for Advanced Simulation, Forschungszentrum Jülich and JARA — We present the first fully self-consistent first-principles investigation of single chiral magnetic skyrmions as entire entities based on density functional theory. The work is tied to skyrmions with sub-5nm diameters embedded within thin ferromagnetic films stabilized through interfacial Dzyaloshinskii-Moriya interactions. We found that the non-collinearity of the magnetic texture inside the skyrmions leads to spin-mixing of the electronic structure, which can be probed as site-dependent tunneling spin-mixing magnetoresistance (TXMR). The conduction inhomogeneity can reach values up to 20% in Pd/Fe/Ir(111) samples [1]. The non-collinear component of the TXMR has been experimentally verified [2], validating our theoretical calculations and showing the capability of the TXMR to resolve complex nanoscale spin-textures. The work is carried out with the newly developed Jülich relativistic Korringa-Kohn Rostoker Green function method [3]. [1] Crum, D.M. et al. Perpendicular reading of single confined magnetic skyrmions. Nat. Commun. **6** 8541 (2015). [2] Hanneken, C. et al. Electrical detection of magnetic skyrmions by tunnelling non-collinear magnetoresistance. Nat. Nanotech. doi:10.1038/nnano.2015.218 (2015). [3] Bauer, D.S.G., Schriften des Forschungszentrum, Key Technology **79** (2014).

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