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Josephson Junctions Carrying Spin-Triplet Supercurrent for Cryogenic Memory[1] JOSEPH A. GLICK, SAMUEL EDWARDS, DEMET KORUCU, BETHANY M. NIEDZIELSKI, REZA LOLOEE, W. P. PRATT JR., NORMAN O. BIRGE, Michigan State University — Recent experiments with Josephson junctions containing ferromagnetic materials show that they have potential for cryogenic random access memory with extremely low power consumption [1]. We discuss a new class of junctions containing three magnetic layers that carry spin-triplet supercurrent and whose phase state can potentially be toggled between values of 0 and π [2]. We discuss experiments in which the central magnetic layer, which must have magnetization perpendicular to both the top and bottom magnetic layers, is a synthetic anti-ferromagnet (SAF) with perpendicular magneto-anisotropy (PMA). One main advantage of this configuration is that PMA SAFs can be easily patterned into nano-magnets with very low stray fields, which may lead to better controlled magnetic switching of the other magnetic layers. Additionally, the long-range coherence of spin-triplet supercurrent would make the junctions less sensitive to the precise thickness of the ferromagnetic layers. Besides this there are enticing opportunities to explore the physics of spin-polarized supercurrent and the role of spin-dependent scattering asymmetries in these systems.
[1] E. C. Gingrich, et al., Nature Phys. 12, 564567 (2016)
[2] M. Houzet and A. I. Buzdin, Phys. Rev. B 76, 060504(R) (2007)

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