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Theoretical limit of the minimal magnetization switching field and the shape of a field pulse for minimal reversal time of Stoner particles X.R. WANG, Z.Z. SUN, The Hong Kong University of Science and Technology — The theoretical limit of the minimal magnetization switching field and the optimal field pulse design for uniaxial Stoner particles are investigated. Two results are obtained. One is the existence of a theoretical limit of the smallest magnetic field out of all possible designs. It is shown that the limit is proportional to the damping constant in the weak damping regime and approaches the Stoner-Wohlfarth (SW) limit at large damping. For a realistic damping constant, this limit is more than ten times smaller than that of so-called precessional magnetization reversal under a non-collinear static field, showing a big room for possible improvement in current available strategies. The other is on the optimal field pulse design: If the magnitude of a magnetic field does not change, but its direction can vary during a reversal process, there is an optimal design that gives the shortest switching time. The switching time depends on the field magnitude, damping constant and magnetic anisotropy. The two results can be used to evaluate various magnetization reversal strategies. Reference: Z.Z. Sun, and X.R. Wang, Phys. Rev. B 73, 092416 (2006); 74, 132401 (2006); Phys. Rev. Lett. 97, 077205 (2006).

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