Physics of the Solid State 1998 vol.40 N3, pages 474-476

On the theory of quantum stochastic resonance in single-domain magnetic particles

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Abstract

The phenomenon of stochastic resonance in a system of small magnetic particles with easy-axis anisotropy, where stochastic magnetization reversal in such particles occurs by macroscopic quantum tunneling of the magnetization, is investigated theoretically. An analytical model in the approximation of discrete orientations is proposed for calculating the dynamic (rf) susceptibility of easy-axis single-domain particles in a constant magnetic field applied perpendicular to the easy axis. The new contribution of this model lies in a more accurate description of quantum tunneling under conditions of rf modulation at temperatures close to absolute zero. The adequacy of the proposed approximation is checked by numerical modeling and by comparing the results with the published results on quantum tunneling and stochastic resonance. © 1998 American Institute of Physics.