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Spin-interference in complex spin-orbit fields in ring systems¹ HENRI SAARIKOSKI, RIKEN Center for Emergent Matter Science (CEMS), Saitama 351-0198, Japan, FUMIYA NAGASAWA, M. WANG, JUNSAKU NITTA, Department of Materials Science, Tohoku University, Sendai 980-8579, Japan — We consider here interplay between complex spin-orbit (SO) and magnetic fields in spininterference experiments in mesoscopic semiconductor ring systems. We specifically focus on Dresselhaus[001] spin-orbit interaction and Rashba spin-orbit interaction, as well as an in-plane magnetic field. In a two-dimensional (2D) electron gas subject to these SO fields weak localization effects has been predicted to give rise to anisotropic magnetoresistance as a function of in-plane field direction [A. G. Mal'shukov et al., Phys. Rev. B 59, 5702 (1999)]. However, experimental data in mesoscopic ring arrays indicates surprisingly that there is a phase shift in anisotropy as a function of spin-orbit field which is in contrast to the calculations for the 2D electron gas. We show both 1D and 2D theoretical calculations and propose that this is due to spin interference effects in the ring geometry and anisotropy from the wire is weak. We demonstrate significant 2D effects arising in multi-mode wires.

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