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Spatial correlations in chaotic nanoscale systems with spin-orbit coupling ANH NGO, Department of Physics, and Nanoscale & Quantum Phenomena Institute, Ohio University, 45701 USA, EUGENE KIM, Department of Physics, University of Windsor, Windsor, Ontario, Canada N9B 3P4, SERGIO ULLOA, Department of Physics, and Nanoscale & Quantum Phenomena Institute, Ohio University, 45701 USA — We investigate the properties of wave functions in chaotic nanostructures with spin-orbit (SO) interactions, focusing, in particular, on the evolution of the wave function statistics as the SO interaction is varied. We compare results obtained via random matrix theory for one- and two-point distribution functions with numerical results obtained from microscopic calculations on a stadium billiard, both with and without magnetic fields. We discuss how SO interactions weaken correlations in the system, as it evolves from the gaussian orthogonal (GOE) to the symplectic ensemble (GSE). In the presence of magnetic fields, a weak SO coupling decorrelates the two spin components, resulting in decoupled gaussian unitary ensembles (dGUE). We discuss experimental consequences of these (weakened) correlations, particularly for spin-dependent phenomena.

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