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Noise in Mesoscopic Systems

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In the foreground of contemporary physics, the role of chaos and order concomitantly present in physical systems is experimentally and theoretically well-grounded. The ubiquity of chaos and order in systems that include atomic nuclei and artificial atoms, among others, imposes the central question about the conceptual common element to all of them. In the light of the random matrix theory (RMT), we found that all of these systems can support the universality of fundamental symmetries described by RMT and, therefore, mesoscopic systems composed of atomic confined aggregates can emulate scattering phenomena on smaller scales such as those of atomic nuclei. Mesoscopic systems can be controlled and create confinement phenomena that encompass the fundamental Wigner-Dyson symmetries as well as all others categorized by Cartan. In particular, among other results, the present study demonstrated that the shot-noise power can categorize not only the Wigner-Dyson classes, through the accumulation of spin in electronic reservoirs, but also the chiral classes, through scattering in graphene nanostructures. Furthermore, we investigate both the conductance and the shot-noise power of a confined chiral device that engenders subtle embedded backscattering mechanisms. We present analytical results and the correspondent numerical confirmation of the chiral electronic sublattice signal.