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Examining the Quantum Nature of Edge Magnetism in Graphene Nanoribbons MICHAEL GOLOR, CORNELIE KOOP, RWTH Aachen University, THOMAS C. LANG, Boston University, MANUEL J. SCHMIDT, STEFAN WESSEL, RWTH Aachen University — Based on low-energy theories for interaction effects along graphene edges, which preserve the full quantum nature, we study edge magnetism in various types of graphene nanoribbons. We find that the relevant physics is well captured by an effective Heisenberg model with extended ferromagnetic interactions along and antiferromagnetic interactions across the ribbon edges. The basic principles of edge magnetism are then studied in short and narrow armchair ribbons, for which we predict magnetic response and STS signatures that could be probed in future experiments. For the case of macroscopically large chiral ribbons, we find the spin-spin-correlation length to grow exponentially with the ribbon width, demonstrating the importance of quantum fluctuations in these systems.

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