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Magnetic Phase Transition Induced by the Hubbard and Spin-orbit Interactions in a Nanoribbon Geometry HYEONG JUN LEE, MOO YOUNG CHOI, Department of Physics and Astronomy and Center for Theoretical Physics, Seoul National University, Seoul 151-747, Korea, GUN SANG JEON, Department of Physics, Ewha Womans University, Seoul 120-750, Korea — The local repulsive Coulomb interaction between the electrons tends to cause a Mott transition into a magnetically ordered phase. In a honeycomb lattice, particularly, the magnetic order is known to emerge on the edges of graphene, which is attributed to the electron interactions. Meanwhile, the introduction of the spin-orbit interaction gives rise to metallic boundary states, which is a prominent characteristic of the topologically nontrivial materials. We study the effect of the spin-orbit interaction on the edge states as well as the bulk properties of the electron system on the honeycomb lattice. By employing a Hartree-Fock approximation, we compute the local magnetization in the half-filled nanoribbon system at zero temperature. We pay particular attention to the decaying behavior of the local magnetization from the edge toward the center. It is found that the characteristic length associated with the decay is divergent on the phase boundaries. Such slow decay is found to be algebraic in the thermodynamic limit. We discuss the relation between the bulk phase transitions and the decay of magnetization at the edges.

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