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Spin waves in graphene nanoribbon devices FRANCISCO CULCHAC, Universidade Federal do Rio de Janeiro, ANDREA LATGÉ, Instituto de Física, Universidade Federal Fluminense, RODRIGO CAPAZ, Instituto de Física, Universidade Federal do Rio de Janeiro, ANTONIO COSTA, Instituto de Física, Universidade Federal Fluminense — We investigate spin excitations and electronic properties of graphene nanoribbon devices with zigzag edges. The magnetic region of the device is coupled to nonmagnetic metallic leads. The ground state of the magnetic region is described self-consistently within a mean-field scheme. Spin excitations are extracted from the transverse dynamic spin susceptibility. Several standing-wave modes can be identified. We study the behavior of these modes as the coupling between the magnetic region and the leads is varied. A central point found is that for a finite zigzag nanoribbon, spin excitations are damped at all finite energies. The signature of antiferromagnetic correlations is still present in the predominantly linear relationship between the standing-mode energy and the mode wave vector. The effect of an external doping is also considered and, as in the infinite case, it is found that ferromagnetic order along the ribbon's edges becomes unstable at modest doping levels. We also show the behavior of the spin excitations in the infinite zigzag nanoribbons when an electric field is applied in the transversal direction. As it is well known, this system presents a half-metallic state. A reduction of the spin-wave lifetime is found for increasing electric field intensities.

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