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Electron dynamical polarization function and plasmons in metallic armchair graphene nanoribbons SAMVEL BADALYAN, Center for Nanostructured Graphene (CNG), Department of Micro and Nanotechnology, Technical University of Denmark, DK-2800 Kongens Lyngby, Denmark and, ARTSEM SHYLAU, Center for Nanostructured Graphene (CNG), Department of Micro and Nanotechnology, Technical University of Denmark, DK-2800 Kongens Lyngby, Denmark, FRANCOIS PEETERS, Department of Physics, University of Antwerp, Groenenborgerlaan 171, B-2020 Antwerpen, Belgium, ANTTI-PEKKA JAUHO, Center for Nanostructured Graphene (CNG), Department of Micro and Nanotechnology, Technical University of Denmark, DK-2800 Kongens Lyngby, Denmark — The dynamical polarization function and plasmon excitations in metallic armchair graphene nanoribbons are investigated using the random phase approximation. An exact analytical expression for the polarization function of Dirac fermions is obtained, valid for arbitrary temperature and doping. We find that at finite temperatures, due to the phase space redistribution among inter-band and intra-band electronic transitions in the conduction and valence bands, the full polarization function becomes independent of temperature and position of the chemical potential. It is shown that for a given width of nanoribbon there exists a single plasmon mode whose energy dispersion is determined by the graphenes fine structure constant. In the case of two Coulomb-coupled nanoribbons, this plasmon splits into in-phase and out-of-phase plasmon modes with splitting energy determined by the inter-ribbon spacing.

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