Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Transport phenomena in deformed graphene: Magnetic field versus curvature THOMAS STEGMANN, Instituto de Ciencias Físicas, Universidad Nacional Autónoma de México, NIKODEM SZPAK, Fakultät für Physik, Universität Duisburg-Essen, Germany — The current flow in deformed graphene nanoribbons is studied theoretically. Using a tight-binding model, we apply the nonequilibrium Green's function (NEGF) method to investigate how a localized deformation and a perpendicular magnetic field affect the current flow. While a magnetic field acts differently on electrons and holes due to their oposite charges, the deformation treats them equivalently. Applying the eikonal approximation to the Dirac equation, which is effectively satisfied at long wavelengths, we show that the obtained geodesic lines are compatible with the current flow paths of our NEGF calculations. The solution of the Mathisson-Papapetrou equations also shows that the effect of the deformation can be subdivided in two parts. First, a pseudo-magnetic field with sixfold symmetry of attractive and repulsive regions, which acts differently on electrons and holes, but changes its sign when going from the K to the K' point. Second, an attractive force due to the curvature of the ribbon, which treats electrons and holes equivalently. We conclude with an outlook on how to use deformed graphene ribbons for geometrical focusing of the current flow.

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Date submitted: 13 Nov 2014 Electronic form version 1.4