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Geometry Induced Charge Separation on a Helicoidal Ribbon

AVADH SAXENA, Los Alamos National Lab, VICTOR ATANASOV, Bulgarian Academy of Sciences, ROSSEN DANDOLOFF, Universite de Cergy-Pontoise, GEOMETRY AND NONLINEARITY COLLABORATION — Helical ribbons are ubiquitous in nature including in the carbon based nanostructures such as graphene. We derive an effective geometry-induced quantum potential for a particle confined on a helicoidal ribbon. This potential leads to the appearance of localized states at the rim of the helicoid. In this geometry the twist of the ribbon plays the role of an effective transverse electric field on the surface and thus this is reminiscent of the quantum Hall effect. We also calculate the effective polarization and discuss the consequences of these findings.

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