

Pseudoquantum Electrodynamics and the Chern-Simons action in (2+1) dimensions

Van Sérgio Alves¹, Gabriel C. Magalhães¹, Leandro O. Nascimento^{2,3}

¹ *Faculdade de Física, Universidade Federal do Pará,
Av. Augusto Correa 01, Belém PA, 66075-110, Brazil*

² *International Institute of Physics, Campus Universitário Lagoa Nova, C.P. 1613, Natal RN, 59078-970, Brazil*

³ *Faculdade de Ciências Naturais, Universidade Federal do Pará, C.P. 68800-000, Breves, PA, Brazil*

We study a quantum field theory which describes both the electromagnetic and statistical interactions among two-dimensional electrons. This is shown by means of the effective action of the model. While the electromagnetic interaction is described by the so-called Pseudoquantum electrodynamics (PQED), the statistical term is obtained from the well-known Chern-Simons action. In the static limit, we show that the Chern-Simons parameter plays the role of an effective dielectric constant, which decreases the interaction in the large-screening limit. Thereafter, we apply the one-loop perturbation theory in our model. Thus, we obtain the electron self-energy, the renormalized mass, the quantum corrections for the electron g -factor and the renormalized Fermi velocity for both relativistic and nonrelativistic versions of the model, using the renormalization group method.

Keywords: Pseudoquantum Electrodynamics, Chern-Simons, Planar Systems.