

## Chiral effects in gauge theories

*Thursday 11 May 2017 09:20 (20 minutes)*

We study the chiral effects in QED in the magnetized vacuum and medium. We report the generation of a pseudovector electric current having imbalanced chirality in an electron-positron strongly magnetized gas in QED. It propagates along the external applied magnetic field  $B$  as a chiral magnetic effect in QED. It is triggered by a perturbative electric field parallel to  $B$ , associated to a pseudovector longitudinal mode propagating along  $B$ . An electromagnetic chemical potential was introduced, but our results remain valid even when it vanishes. A nonzero fermion mass was assumed, which is usually considered vanishing in the literature. In the quantum field theory formalism at finite temperature and density, an anomaly relation for the axial current was found for a medium of massive fermions. It bears some analogy to the Adler-Bell-Jackiw anomaly. From the expression for the chiral current in terms of the photon self-energy tensor in a medium, it is obtained that pair creation contribute to the chiral current due to longitudinal photons (out of light cone). This demonstrates that pair creation creates a chiral asymmetry in a magnetized medium. In the static limit, an electric pseudovector current is obtained in the lowest Landau level. We also study the chiral effects in QCD and its relation with the strong CP problem. Finally, we discuss about the introduction of a chiral chemical potential in the quantum field theory formalism at finite temperature and density.

**Primary authors:** ACOSTA AVALO, Jorge Luis (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba); Prof. PEREZ ROJAS, Hugo Celso (Instituto de Cibernética, Matemática y Física (ICIMAF), La Habana, Cuba)

**Presenter:** ACOSTA AVALO, Jorge Luis (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), La Habana, Cuba)

**Track Classification:** SMFNS2017