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QCD with axial chemical potential: possible manifestations

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The low energy realization of QCD in terms of mesons is studied when an axial chemical potential is present; a situation that may be relevant in heavy ion collisions. We also consider the 'two flavour'Nambu–Jona-Lasinio model in the presence of a vector and an axial external chemical potential as a QCD replica and study the phase structure of the model at zero temperature. The presence of an axial charge has profound consequences on meson physics and causes birefringence of vector mesons and photons in such a medium. We propose that local parity breaking induced by a large-scale fluctuation of topological charge at large temperatures and/or condensation of pseudoscalar mesons in the isotriplet channel for large baryon densities may be (partly) responsible for the substantial dilepton excess that is found for low invariant masses and moderate values of pT in central heavy ions collisions.

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