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Does spin tensor play a role in relativistic hydrodynamics ?

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The search for and the recent evidence of polarization in relativistic heavy ion collisions has raised fundamental questions about the most general theoretical description of a relativistic polarizable neutral medium and especially about the role of the spin tensor in relativistic hydrodynamics. The so-called pseudo-gauge invariance under transformations of the stress-energy and spin tensors prescribes that all final state measurements should be independent of the particular tensor operators chosen to describe the relativistic fluid. In this talk, I will review the subject and discuss the fundamental definitions of local equilibrium, spin potential and polarization in a Quantum Field Theory framework. As the local equilibrium density operator turns out not to be pseudo-gauge invariant, I will discuss the phenomenological consequences for polarization.

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