19th International Conference on QCD in Extreme Conditions (XQCD 2023)

Contribution ID: **94** Type: **Poster**

Pseudogauge freedom and the SO(3) algebra of spin operators.

Wednesday 26 July 2023 19:35 (25 minutes)

The energy-momentum and spin tensors for a given theory can be replaced by alternative expressions that obey the same conservation laws for the energy, linear momentum, as well as angular momentum but, however, differ by the local redistribution of such quantities (with global energy, linear momentum, and angular momentum remaining unchanged). This arbitrariness is described in recent literature as the pseudogauge freedom or symmetry. In this letter, we analyze several pseudogauges used to formulate the relativistic hydrodynamics of particles with spin 1/2 and conclude that the canonical version of the spin tensor has an advantage over other forms as only the canonical definition defines the spin operators that fulfil the SO(3) algebra of angular momentum. This result sheds new light on the results encountered in recent papers demonstrating pseudogauge dependence of various physical quantities. It indicates that for spin-polarization observables, the canonical version is fundamentally better suited for building a connection between theory and experiment.

Authors: DEY, Sourav (National Institute of Science Education and Research(INDIA)); Prof. FLORKOWSKI, Wojciech (Institute of Theoretical Physics, Jagiellonian University, ul. St. \L ojasiewicza 11, PL-30-348 Krakow, Poland); Dr JAISWAL, Amaresh (School of Physical Sciences, National Institute of Science Education and Research, An OCC of Homi Bhabha National Institute, Jatni-752050, India); Dr RYBLEWSKI, Radoslaw (Institute of Nuclear Physics Polish Academy of Sciences, PL-31-342 Krakow, Poland)

Presenter: DEY, Sourav (National Institute of Science Education and Research(INDIA))

Session Classification: Poster session