Contribution ID: **437** Type: **Poster**

Exact equilibrium distributions for massive and massless fermions with rotation and acceleration

Friday 8 April 2022 14:08 (4 minutes)

The equilibrium distribution function of free fermions including the spin degrees of freedom is a cornerstone for chirality and polarization studies in relativistic heavy ion physics.
In this talk, we present the first calculation of the exact Wigner function, spin polarization vector and the chiral distribution function for massless and massive free fermions at general global equilibrium with non-vanishing vorticity and acceleration.
The final expression includes all quantum corrections at all orders in thermal vorticity, hence in $\hbar$.
The method is based on an analytic continuation from imaginary thermal vorticity, factorization of the density operator and an iterative solution of the algebraic equations in the thermal expectation values.
A comparison with the previously assumed equilibrium expressions is made and implications are discussed.

[1] F. Becattini, M. Buzzegoli and A. Palermo, JHEP 02 (2021) 101
[2] A. Palermo, F. Becattini and M. Buzzegoli, JHEP 10 (2021) 077

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Presenter: PALERMO, Andrea

Session Classification: Poster Session 3 T12_1

Track Classification: New theoretical developments