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Insight into the magnetic response of hadron gas using non-extensive statistics

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Non-central heavy-ion collisions at ultra-relativistic energies are unique in generating magnetic fields of the most significant strength in the laboratory. The fields produced at the early stages of the collision could affect the properties of Quantum Chromodynamics (QCD) matter formed in the heavy-ion collisions. Moreover, this transient magnetic field can also affect the thermodynamic and transport properties of the final state dynamics of the system. In this work, we investigated the thermodynamic properties such as energy density, entropy density, pressure, and speed of sound of a hadron gas in the presence of an external static magnetic field using thermodynamically consistent non-extensive Tsallis statistics. Further, the magnetization of such a system is also studied. This analysis reveals an interplay of the diamagnetic and paramagnetic nature of the system in the presence of the external magnetic field of varying strength for non-central heavy-ion collisions as one goes from RHIC to the LHC energies.

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