Contribution ID: **88** Type: **Oral**

Thermodynamics of strongly magnetized dense quark matter from hard dense loop perturbation theory

Saturday 6 September 2025 15:40 (20 minutes)

In this work we discuss the hard dense loop perturbation theory approach for studying the thermodynamics of strongly magnetized dense quark matter. The study has been confined to one loop self-energy of quarks and gluons respectively, for calculating the free energy of the system. Thermodynamic quantities such as pressure, magnetization, second-order quark number susceptibility, and speed of sound have been computed, and their behavior with chemical potential and magnetic field has been studied. It is found that the speed of sound approaches the speed of light at extremely high densities. The results may be helpful for studying extremely magnetized and dense objects such as neutron stars and magnetars.

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Session Classification: Plenary Session