ID de Contribution: **18** Type: **Non spécifié**

A new perturbative approach to dense matter: thermal Loop Tree Duality

jeudi 18 septembre 2025 10:30 (1 heure)

It is well established that the high-density constraint from perturbative QCD, though directly applicable only at densities exceeding those inside neutron stars, plays a central role in the model-independent inference of the neutron-star equation of state (EoS). The completion of the next-to-next-to-next-to-leading order (N3LO) pressure of dense quark matter is expected to significantly sharpen this constraint. In this talk, I will discuss a recent methodological breakthrough: the extension of the Loop Tree Duality framework of vacuum QFT to nonzero temperature and density. This advance removes the last major conceptual obstacles to the N3LO calculation and opens the door to a wide range of high-order perturbative computations in thermal field theory.

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Classification de Session: Holography & Dense Matter