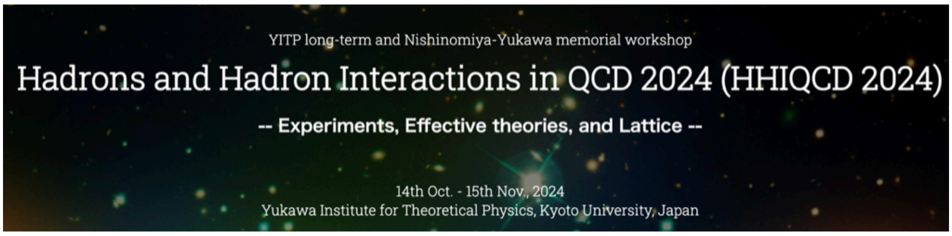

Contribution ID: **25** Type: **4th week (Nuclear matter under extreme conditions)**

Framework for phase transitions between the Maxwell and Gibbs constructions

Thursday, October 31, 2024 4:30 PM (30 minutes)

By taking the nucleon-to-quark phase transition within a neutron star as an example, we present a thermodynamically consistent method to calculate the equation of state of ambient matter so that transitions that are intermediate to those of the familiar Maxwell and Gibbs constructions can be described. This method does not address the poorly known surface tension between the two phases microscopically (as, for example, in the calculation of the core pasta phases via the Wigner-Seitz approximation) but instead combines the local and global charge neutrality conditions characteristic of the Maxwell and Gibbs constructions, respectively. Overall charge neutrality is achieved by dividing the leptons to those that obey local charge neutrality (Maxwell) and those that maintain global charge neutrality (Gibbs). The equation of state is obtained by using equilibrium constraints derived from minimizing the total energy density. The results of this minimization are then used to calculate neutron star mass-radius curves, tidal deformabilities, equilibrium and adiabatic sound speeds, and nonradial g-mode oscillation frequencies for several intermediate constructions. The equation of state at finite temperature and off-β-equilibrium, constructed from this framework, can be used to study the impact of first-order phase transitions in neutron star mergers and core-collapse supernovae.

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