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Finite-Temperature CMF-HRG Equation of State within MUSES

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Using the finite-temperature Chiral Mean Field (CMF) model within the MUSES framework—where the baryon octet and decuplet, including strange baryons, interact via meson fields and are treated at finite through Fermi integrals—we extend the particle content by adding species not included in CMF as a non-interacting ideal gas of PDG-listed hadrons and resonances, explicitly incorporating strange mesons and resonances. The resulting, thermodynamically consistent equation of state spans a wide range of temperatures and densities, enabling direct comparison with continuum-extrapolated lattice-QCD thermodynamics near ==0 while remaining suitable for neutron-star and merger applications at high density. We outline calibration and validation targets against lattice and hadronic benchmarks and discuss implications for astrophysical modeling.

Kumar, Rajesh, Joaquin Grefa, Konstantin Maslov, Yuhan Wang, Arvind Kumar, Ralf Rapp, Claudia Ratti, and Veronica Dexheimer, Physical Review D 111, no. 7 (2025): 074029.

Cruz-Camacho, Nikolas, Rajesh Kumar, Mateus Reinke Pelicer, Jeff Peterson, T. Andrew Manning, Roland Haas, Veronica Dexheimer, Jaquelyn Noronha-Hostler, and (MUSES Collaboration), Physical Review D 111, no. 9 (2025): 094030.

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