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Universal properties of ideal hydrodynamic evolution near the QCD critical point

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The hydrodynamic evolution of the quark-gluon plasma (QGP) created in the initial stage of heavy-ion collisions can be approximated by tracking the lines on the QCD phase diagram where the entropy per baryon, s/n, are fixed and conserved at the initial values. The universality of critical phenomena enables us to describe the thermodynamic properties near the QCD critical point using the critical exponents and mapping parameters to the 3D Ising universality class. Our study aims to investigate the universal properties of isentropes near the QCD critical point, specifically focusing on the universal ridge topography of s/n on the phase diagram and its resulting hill shape (local maximum) along the first-order phase transition line on either side of the QGP or hadron phases. We examine the applicability of our model-independent formula to specific examples of the equation of state, including those studied by the Beam-Energy-Scan-Theory (BEST) collaboration.

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