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Dilepton Signature of a First-Order Phase Transition

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Dileptons provide a unique way to access the properties of the fireball created in heavy-ion collisions. Since the dilepton yield directly depends on the duration of the fireball evolution, dileptons are valuable probes of the phase structure of strongly interacting matter. We study dilepton production in the SIS18 energy range by calculating and comparing the thermal dilepton emission for coarse grained microscopic transport models and hydrodynamical approaches with different equations of state, applying state-of-the-art in-medium spectral functions from hadronic many-body theory, chiral mixing in a chiral mean field model as well as from functional renormalization group methods. Presenting systematic comparisons of the space-time evolution of the fireball by means of various coarse-grained transport simulations and collision systems with respect to energy and participant number, we will show that the influence of the system size on the spectra is well under control and enhancements in heavy-ion collisions at SIS18 energies stem primarily from phase transitions.
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