Dilepton production and resonance properties within a new hadronic transport approach

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Motivation
- only electromagnetic interaction: clean probe for hot and dense matter
- extract medium properties and medium modifications over whole lifetime of collision
- probe for resonance description and properties orthogonal to hadronic observables

SMASH
- new hadronic transport approach for dilute non-equilibrium stages of heavy-ion collisions and low energy collisions
  \[ p^\mu \partial_\mu f_i(x, p) + m_i F^{\alpha\beta} \partial_\alpha \partial_\beta f_i(x, p) = C_{\text{coll}}^i \]
- features: geometric collision criterion, Test Particle Method, Mean-Field potentials, Fermi motion, Pauli blocking
- degrees of freedom: all well-known particles from PDG up to a mass of 2 GeV
- goal: standard reference for hadronic system with vacuum properties

Dilepton Production in SMASH
- dileptons produced by resonance decays
- direct and Dalitz dilepton decay channels
- continuously perform dilepton decays and weight them by taking their decay probability into account (better statistics)
- more details and results in [2]

Vacuum Transport
- di-electron invariant mass spectra for elementary (pp) and small (CC) systems agree with HADES data
- solid baseline for resonance description with Breit-Wigner spectral function and collisional broadening
- contributions for directs decays of all vector mesons below hadronic thresholds

Coarse - Graining
- extraction of T and \( \mu_B \) from space-time cells (routine adapted from S. Endres [3])
- thermal dilepton emission from cells including medium-modified spectral function for vector mesons
- for larger systems (ArKCl) at low energies dilepton invariant mass spectrum sensitive to medium modifications

Hybrid Approach
- study the effect of rescattering in the late dilute stages on the different dilepton observables (dN/dM, dN/dp, \( \nu_2 \))
- hybrid approach: combine dilepton radiation from hydrodynamics (MUSIC) and hadronic afterburner (SMASH)
- dilepton emission from hydro stage by G. Vujanovic [5]
- first result: di-electron \( <p> \) increases, when employing hadronic afterburner

References

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