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Dilepton production and resonance properties within a new hadronic transport approach

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As electromagnetic probes dileptons open a window to the in-medium properties of vector mesons. In this talk, medium effects to vector mesons are discussed for heavy ion collisions in the low kinetic energy regime of $1-3A$ GeV, where the dielectron emission is accessed by the HADES experiment at GSI. A new hadronic transport approach named SMASH (Simulating Many Accelerated Strongly-interacting Hadrons) is employed to study dilepton production, which is based on vacuum resonance properties and consistently includes dilepton emissions below the hadronic threshold. The approach is validated by an excellent agreement with experimental data up to system sizes of carbon-carbon collisions. After establishing this well-understood baseline in elementary and small systems, the significance of medium effects is investigated with a coarse-graining approach based on the same hadronic evolution. Interestingly, the effect of explicit in-medium modifications to the vector meson spectral functions is already important for dilepton invariant mass spectra in ArKCl and larger systems, even though the transport approach with vacuum properties reveals similar features due the coupling to baryonic resonance and the intrinsically included collisional broadening. In addition, the validated dilepton production allows to assess the importance of a microscopic evolution of the hadronic stage by studying the non-equilibrium dilepton radiation in late, dilute stages of high-energy heavy ion collisions, i.e. in hybrid approaches.

Reference:
J. Staudenmaier, J. Weil, V. Steinberg, S. Endres, H. Petersen, "Dilepton production and resonance properties within a new hadronic transport approach in the context of the GSI-HADES experimental data", arXiv:1711.10297 [nucl-th]

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