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Characterising the hot and dense fireball with virtual photons at HADES

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The High-Acceptance-Di-Electron-Spectrometer (HADES) at GSI, Darmstadt, measures heavy-ion and elementary collisions at beam energies of a few GeV, thereby accessing the QCD phase diagram at high densities, around 2-3 times the saturation density, and moderate temperatures in the order of tens of MeV.

Such conditions are similar to those expected in neutron star mergers, which provides a meaningful opportunity to study the nuclear Equation-Of-State in the laboratory, not only fundamentally, but also specifically to deepen our understanding of such astrophysical phenomena.

One of the essential pillars of the HADES program is the reconstruction of rare electromagnetic probes. Due to their penetrating nature, they encode unique and direct information from all stages, including the hottest and densest, and can probe the evolution of the colliding system.

In this contribution, we present measurements of dielectrons reconstructed from Ag+Ag and Au+Au collisions at $\sqrt{s_{NN}} = 2.55$ GeV and $\sqrt{s_{NN}} = 2.42$ GeV. For one, we focus on the isolation of the thermal excess which entails information on the lifetime and temperature of the fireball. For another, we extend the analysis with an investigation of collective phenomena, in particular the measurement of the azimuthal anisotropy. This gives new experimental hints about the origin and development of the collective flow over time at beam energies of a few GeV.

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