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Heavy-Ion results from the HADES experiment

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The HADES experiment at GSI was designed to investigate the properties of hadrons inside dense nuclear matter. The latter is created by heavy-ion collisions at energies of 1−-2 AGeV. Currently, HADES is the only running experiment that studies the region in the QCD phase diagram of very high net-baryon densities and moderate temperatures. The created state of matter, in fact, resembles matter created during merger of neutron stars with particular configuration. While the gravitational waves emitted by such events are expected to tightly constrain the equation of state of nuclear matter, HADES has the potential of providing a deeper understanding about the microscopic properties of such matter due to an improved modeling of heavy heavy-ion collisions. One of the goals is to improve the knowledge about the generation of hadronic masses. At three times normal nuclear matter density the quark antiquark condensates, which are an order parameter of chiral symmetry restoration, are partially depleted and, therefore, HADES is able to provide crucial information by investigating the in-medium properties of hadrons. One of the best probes that one can use to investigate a strongly interacting baryon-rich medium are the dileptons emerging from virtual photon decays. Since electromagnetic probes decouple from the dense interaction region once they are produced, their phase space distributions carry information about the temperature and structure of the dense QCD medium. Hadrons carrying strangeness are valuable messengers as well, because at 1−-2 AGeV their production threshold is above the energy available in a single N+N collision. This means that additional energy is provided by the medium and, therefore, strange hadrons are also good probes of the in-medium properties. Both the dilepton and strangeness results from the HADES Au+Au data at 1.23 AGeV will be presented.

Primary author: Dr FRANCO, Celso (LIP-Lisbon)

Co-author: ON BEHALF OF THE HADES COLLABORATION

Presenter: Dr FRANCO, Celso (LIP-Lisbon)

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