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Time-Like Baryon Transitions studies with HADES

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Collaboration

HADES

Abstract content

The High Acceptance Di-Electron Spectrometer (HADES) [1] installed at GSI is a versatile detector, which was originally designed to study medium effects in e^+e^- production in heavy-ion reactions in the SIS-18 energy range (1-2 GeV/nucleon). Its excellent particle identification capabilities allowed for a systematic investigation of dielectron, strange particles and pion production in proton, deuteron or heavy-ion induced reactions on proton or nucleus. The obtained dilepton spectra measured at various beam energies show important contributions from baryon resonance decays ($R \to Ne^+e^-$) and a strong influence of the intermediate vector mesons ($\rho/\omega/\phi$) in the corresponding time-like electromagnetic form factors.

In order to directly access such transitions, HADES has started a dedicated pion-nucleon program using the pion beam line at GSI [2]. For the first time, combined measurements of hadronic and dielectron final states have been performed in $\pi - N$ reactions in the second resonance region, using polyethylene and carbon targets. While providing new determi- nations of the baryon-meson couplings, the results allow to investigate the validity of the Vector Dominance Model for baryon transitions and the helicity structure of the time like electromagnetic baryon transitions, paving the way for more precise future measurements.

The results of the HADES collaboration obtained with proton and pion beams will be presented, with emphasis on the connection with the HADES hadronic matter program. Prospects for HADES measurements at SIS-18 in the near future within the FAIR-Phase0 programme and later on at SIS-100 (FAIR) will also be discussed.

References:

[1] G. Agakishiev et al. (HADES collaboration), Eur. Phys. J. A41 (2009) 243.

[2] J. Adamczewski-Musch et al. (HADES collaboration), Eur. Phys. J. A53 (2017) 188.

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