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Transition Form Factors from HADES

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A major goal of the High Acceptance Di-Electron experiment (HADES) [1] at GSI is to study the electromagnetic properties of hadronic matter in the 1-3.5 GeV/nucleon incident energy range. Its excellent particle identification capabilities allowed for a systematic investigation of dielectron, strange particles and pion production in pion, 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⟶Ne+e−) and a strong influence of the intermediate vector mesons (ρ/ω/φ).

A prominent enhancement in the respective electromagnetic Transition Form-Factors (eTFF) at q2 near the vector meson (rho/omega) poles has been predicted by various calculations reflecting strong baryon-vector meson couplings [2]. The first measurements of the Dalitz decay of Delta(1232) and of higher mass resonances in p+p collisions have been recently concluded [3, 4], indicating the important role played by rho meson. In order to directly access such transitions, combined measurements of hadronic and dielectron final states have been performed in π−N reactions in the second resonance region, using polyethylene and carbon targets [5]. The two-pion data have been analysed using the Bonn-Gatchina PWA together with results of other experiments allowing for the separation of resonance contributions and their decay channels. In particular the off-shell rho meson contribution has been extracted providing an important constraint for the interpretation of dielectron invariant mass spectra measured in the same reaction [6]. Angular distributions of emitted electrons have been also analysed allowing for the estimation of hadronic spin density matrix elements as a function of virtual photon emission angle, as suggested in [7, 8]. They provide independent information about spin and parity of the involved resonances and about virtual photon polarization. This presentation will summarize most important results obtained in proton and pion induced reactions measured with HADES and discuss the future plans with the elementary beams at higher energies.

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Collaboration

HADES Collaboration

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