Elementary reactions studied with Hades: a hadron landscape

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The HADES spectrometer is designed to study of hadron properties in nuclear matter. It allows to investigate at the same time the dilepton signatures and the hadronic decays of non strange and strange mesons and baryons. Of particular interest are the elementary reactions such as p+p, p+A at kinetic beam energies varying between 1.25 GeV and 3.5 GeV that have been extensively studied during the last years. For a better understanding of the dielectron production in heavy ion collisions, the investigation of iso-spin effects in baryonic resonance excitation and the off-shell production of vector mesons in elementary reactions turned out to be crucial. We observe indeed a large difference in dielectron production in p + p and quasi-free n+p reactions measured at the same beam energy and the understanding of the elementary collisions remains challenging. Considering the measurement of the omega meson in p+Nb and p+p collisions at 3.5 GeV, an excess yield of electron pairs with momenta $P_{ee} < 0.8$ GeV/c below the omega pole mass was observed when comparing the two data set. For electron pairs with momenta $P_{ee} > 0.8$ GeV/c no significant differences in the spectral distributions are observed in the two data sets. This effect is strongly linked to the omega properties in cold nuclear matter. Along this line also strange hadrons have been investigated for the elementary collisions exploiting their hadronic decays. Strange baryons like $\Sigma(1385)$ and $\Lambda(1405)$ have been measured in p+p reactions at $E_{kin} = 3.5$ GeV and served on one side as reference for AA and pA collisions (as in the case of the dilepton production) and on the other side can shade some light on the production mechanism of such states in NN collisions. The production of K^0_S and Λ in both p+p and p+Nb systems and the study of their kinematic variables can deliver, via the comparisons with microscopic transport models, some insight in the interaction potential with the nuclear environment. Further and important progresses are expected with the upcoming experimental campaign with pion beam at GSI. In this talk the so far achieved results and the future plans will be presented and discussed.

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