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Low mass dimuon production in proton-nucleus collisions at $\sqrt{s} = 27.5$˜GeV with the NA60 experiment

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The study of the production of low mass vector and pseudoscalar mesons in proton-nucleus collisions represents a natural baseline for the heavy-ion observations, allowing to provide a reference in an environment of cold nuclear matter. In-medium modifications of the vector meson spectral functions were actually predicted to occur also in cold nuclear matter, though the experimental evidence at the moment is controversial. Proton-nucleus collisions also give access to the study of strangeness production as a function of the size of the nucleus, providing a robust ground for strangeness enhancement in nuclear collisions. Besides that, the study of the nuclear dependence of particle properties in proton-nucleus collisions, as the transverse momentum spectra and the production cross sections, is an effective tool to understand the dynamics of soft hadron interactions.

The NA60 experiment has collected an unprecedented statistics of 180000 low mass muon pairs in proton-nucleus data at $\sqrt{s} = 27.5$˜GeV exposing to the beam six target materials: Be, Cu, In, W, Pb and˜U. The very good statistical accuracy and dimuon mass resolution allowed us to perform a precision measurement of the ρ line shape related the T parameter of the Boltzmann factor, which was measured for the first time in p-A collisions. The $\rho - \omega$ interference was also investigated and preliminary results are reported. No evidence of in-medium effects is found. In addition, the electromagnetic transition form factors of the η and ω mesons were also measured, with a significant precision improvement with respect to the previous measurements. The ω results, compared to the latest theoretical developments, still show the presence of an anomaly which is not described by theory. For the ω and ϕ mesons, thanks to the good acceptance coverage, the transverse momentum spectra were measured down to zero
pt. Finally, the nuclear dependence of the production cross sections was investigated in terms of the power law $\sigma_{\mathrm{pA}} \propto \mathrm{A}^{\alpha}$, and the α parameter was studied as a function of
pt.

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