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Strangeness in the nuclear medium: experimental studies with the KLOE Drift Chamber.

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The hyperon-pion and hyperon-nucleon(s) correlations following K- nuclear absorption in Helium and Carbon were investigated with the KLOE drift chamber and the results will be presented. To this end, KLOE [1] data (from 2004-2005) was analyzed using the detector itself as an active target. Also results from a more recent run (end of 2012) with a dedicated solid Carbon target will be presented.

The information extracted about the antikaon-nucleon potential is of great importance in the framework of the non-perturbative QCD in the strangeness sector, and the understanding of these processes has consequences that go from hadron and nuclear physics to astrophysics.

In particular, the debated resonance $\Lambda(1405)$ is investigated in the $\Sigma^0 \pi^0$ (a privileged, free of contamination from $\Sigma(1385)$, but still poorly explored channel [2]) and the $\Sigma^+ \pi^-$ channels, generated by K- absorptions (at rest and with 120 MeV/c) on bound protons in ^4He and ^{12}C .

The $\Lambda(1405)$ is generally accepted to be a spin $1/2$, $I=0$, $S=-1$ negative parity baryon resonance assigned to the lowest $L=1$ supermultiplet of the three-quark system, and decays only to $\Sigma \pi$ ($I=0$) through the strong interaction. Its nature still remains unsettled, in the meson-baryon picture it is viewed as a antikaon-nucleon quasi-bound $I=0$ [3], and in the context of chiral unitary models [4][5] two poles emerge in the scattering amplitude in the neighborhood of the $\Lambda(1405)$ mass, both contributing to the final experimental invariant mass.

The antikaon-nucleon potential is also investigated searching for signals from bound kaonic clusters (systems where a kaon is attached inside a nucleus [6]). The existence of such objects is very debated, and it would open the possibility for the formation of very dense baryonic matter and it would imply a deep attractive value for the potential. Results for the Λ -proton, Λ -deuteron and Λ -triton correlations analyses will be presented.

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