Branching Ratio Change in K^- Absorption at Rest and the nature of $\Lambda(1405)$*

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We have investigated in-medium corrections to the branching ratio in K^- absorption at rest and their effect on the charged pion $\pi^\pm$ spectrum. The in-medium corrections considered are due to Pauli blocking, which arises if the $\Lambda(1405)$ is assumed to be a $\bar{K}$-nucleon bound state and leads to a density and momentum dependent mass shift of the $\Lambda(1405)$.

These investigations address the long standing question if the $\Lambda(1405)$ is mostly a three quark state or mostly a $\bar{K}$-nucleon bound state, as first proposed by Dalitz [1]. If the former is the case, the $\Lambda(1405)$ will not be subject to Pauli blocking and the resulting mass shift.

Experimental indication for the bound state picture and the resulting mass of the $\Lambda(1405)$ shift due to Pauli blocking come from the optical potential of the K^- [1] as measured in kaonic atoms. The observed change of sign, from repulsive to attractive, at low density results naturally from the bound state picture of the $\Lambda(1405)$ [2].

Using the same model as [2] and requiring that the optical potential as well as the branching ratios are derived from the same elementary T-matrix, we find that the in-medium corrected, density dependent T-matrix gives a better description of the K^- absorption reaction than the free, density-independent one (see figure 1).

We also propose to investigate the resulting π^+ spectrum more carefully. Although the backgrounds are much more complicated in this case, we find a considerably stronger sensitivity to the proposed in medium effects to warrant a new and more careful look at these spectra.

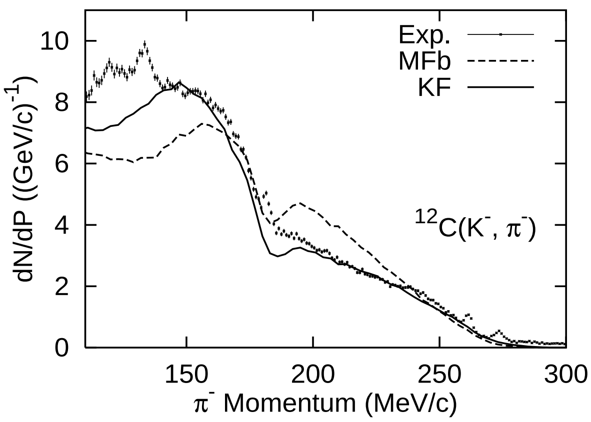

Figure 1: π^- momentum spectrum from K^- absorption at rest on carbon. Dashed and solid lines show the calculated results without and with in medium corrections, respectively.

Our results thus provide more evidence that the dominant component of $\Lambda(1405)$ wave function is indeed the $\bar{K}N$ bound state.

[1] R.H. Dalitz et al, Phys. Rev. 153 (1967) 1617.

[2] V. Koch, Phys. Lett. B337 (1994) 7.

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