\textbf{\Large \Lambda^*(1520) as a new potential source of K^- meson emission in heavy-ion collisions around kaon threshold.}

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\textbf{Physics Motivation}

Gell-Mann-Oakes- Renner relations:

\[ m_K^2 J_K^2 = \frac{m_u + m_e}{2} \lesssim u + s \lesssim \theta (m_K^2) \]

\[ \text{decay constant mass} \]

Nucleus – Nucleus collision at beam Energy of 1 – 2 GeV

- Time of collision
- Temperature of nuclear matter
- Density of nuclear matter
- NN → NK + Λ
- NN → NNK

Effect by in-medium potential:

\[ m_K^+ \quad \text{K^- accelerates (repulsion)} \]

\[ m_K^- \quad \text{K^- slows down (attraction)} \]

In such conditions, quantum chromodynamics (QCD) predicts the partial restoration of the chiral symmetry due to dropping value of the quark-antiquark condensate <q̅q>. The collision zone may produce new hadrons including the ones containing the strange quark, like K^+, φ or Λ^*(1520). The basic properties of particles (like mass and decay constant) are expected to be modified with respect to their values in vacuum.

\textbf{Experimental setups}

\textbf{HADES}

SIS-18 (GSI Darmstadt)

Statistics: \(-10^6\) events

\textbf{FOPI}

SIS-18 (GSI Darmstadt)

Statistics: \(-10^6\) events

\textbf{Estimation of the Λ^*(1520) yield}

Contribution to the K spectrum: \(\Lambda^*(1520) \rightarrow pK^-\) (BR= 22%) decay channel: not measured yet at energies around the kaon threshold!

The kinematics of K^- mesons produced in decay channel is different than that of kaons emitted directly from the collision zone, hence separation kaons needed.

Two sets of experimentally obtained yields HADES and FOPI experiments fitted with the THERMUS statistical model code. Based on the obtained parameters, the yields of \(\Lambda^*(1520)\) were extracted in each case. This allows to estimate the contribution of \(\Lambda^*(1520)\) to the K^- yield.

\(\text{Au + Au @ 1.23A GeV}
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\(\text{Ni + Ni @ 1.91A GeV}
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\(\text{HADES}
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\(\text{FOPI}
\)

The contribution of \(\Lambda^*\) to the K^- should be non-negligible

(March 2019) HADES Collaboration carried out the experiment Ag+Ag at 1.58A GeV

- Very high statistics (10^{10} events)
- Good resolution

Chance for precise reconstruction of K^- and \(\Lambda^*(1520)\) signals