Contribution ID: **64** Type: **not specified**

Investigating the Λ-Λ system: Insights into hyperonic interactions and neutron star cores

Hyperons, baryons containing at least one strange quark, are pivotal to advancing our understanding of matter under extreme conditions.
They are hypothesized to play a crucial role in the dense cores of neutron stars, where their emergence is expected at densities exceeding nuclear saturation.
Among hyperons, Λ hyperons are of particular interest as they have been shown to significantly soften the equation of state (EoS) under the absence of strong repulsive two or three-body forces.
This softening leads to pronounced effects on the maximum mass and radius of neutron stars, introducing discrepancies between observational data and theoretical predictions.
The so-called "hyperon puzzle" is therefore a key topic in nuclear astrophysics.
A deeper comprehension of hyperon-hyperon interactions, is essential to address these challenges.

This study focuses on the production and interaction of Λ-Λ pairs, a doubly strange baryonic system, in proton-proton collisions at $\sqrt{s} = 3.46$ GeV.
Using data from the High Acceptance Di-Electron Spectrometer (HADES) at GSI, the reaction channel $pp \rightarrow \Lambda\Lambda K^+K^+$ was analyzed.
As a foundational step, the near-threshold ($\Delta\sqrt{s_{th}} = 0.24$ GeV) production cross-section is determined.

In this talk, I will detail the experimental methods, analysis procedure and share preliminary results on the production cross-section.
Additionally, I will discuss the Λ-Λ momentum correlations derived from the experimental data.
These findings besides providing a such data-point for near-threshold production cross-section of double strangeness, have broader implications for exploring dense baryonic matter, hypernuclear states, and the underlying QCD-driven interactions in extreme astrophysical environments such as neutron star interiors.

Presenter: APPAGERE, Gandharva (Stockholm University)