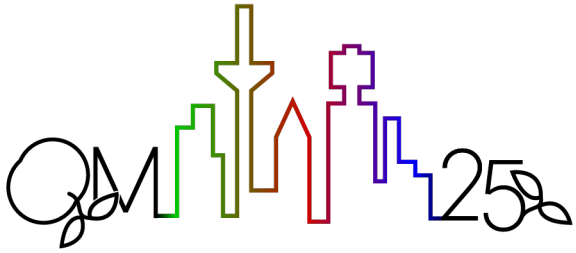

Contribution ID: **153** Type: **Oral**

Probing the structure of light exotic hadron $f_0(980)$ with elliptic flow in p-Pb collisions at the LHC

Tuesday 8 April 2025 17:50 (20 minutes)

The study of exotic hadrons has long been a topic of great interest for the understanding of Quantum Chromodynamics (QCD). As one of the light exotic hadrons, the structure and constituent quark content of $f_0(980)$ have been debated for decades, with theories suggesting it could be a tetraquark state ($s\bar{s}q\bar{q}$) or a hadronic molecule ($K\bar{K}$). Recently, the CMS experiment has measured the elliptic flow anisotropy v_2 of $f_0(980)$ in p-Pb collisions and concluded that $f_0(980)$ is an ordinary $s\bar{s}$ meson, based on the number-of-constituent-quarks (NCQ) scaling of elliptic flow [1]. Assuming that loosely bound light exotic hadrons can only survive at the kinetic freeze-out of the expanding hadronic matter, we have implemented the first $K\bar{K}$ coalescence model to a hybrid viscous hydrodynamic and hadronic transport model to calculate the p_T-spectra and elliptic flow of $f_0(980)$ in p-Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV. Using the well tuned phase-space distributions of kaons in this collision, our coalescence model results agree well with the CMS flow measurements, providing thus a strong evidence for the $K\bar{K}$ molecular nature of $f_0(980)$. Our study also indicates that the CMS Collaboration may have unjustifiably ruled out the $K\bar{K}$ molecular state of $f_0(980)$ by not considering the different v_2 scalings in the coalescence of hadrons and the coalescence of quarks[2].

References

[1] A. Hayrapetyan *et al.* (CMS), arXiv:2312.17092, 2023.
[2] Y. Wang, W. Zhao, C. M. Ko, F. Guo, J. Xie, H. Song, in preparation.

Category

Theory

Collaboration (if applicable)

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Session Classification: Parallel session 23

Track Classification: Light and strange flavor physics & nuclei