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Investigation of the Inner Structure of Glueball Candidate Scalar Mesons with the ALICE Detector

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High-energy nucleus-nucleus collision experiments have played a crucial role in exploring high-temperature quark matter, such as the quark-gluon plasma (QGP). The study of various hadrons, characterized by diverse internal structures, constituent quark numbers, and quark species, has been essential for understanding QGP properties. It has become increasingly evident that hadron yields in nucleus-nucleus and proton-nucleus collisions exhibit modifications compared to proton-proton collisions, which can be attributed to their internal structures. Therefore, analyzing the yields of hadrons with unidentified internal structures in such collisions can give valuable insights into their composition. Numerous hadrons with unknown internal structures, such as f_0 mesons (e.g., $f_0(1500)$ and $f_0(1710)$, leading glueball candidates), have been observed in the mass range of 1-2 GeV/c^2

With its advanced particle identification capabilities, precise secondary vertex determination, and extensive data sample, the ALICE experiment is ideally suited for this study. These features are crucial as these mesons decay into hadrons with relatively long lifetimes, such as the $K^0_s K^0_s$ pair. This presentation will showcase the cross-section of hadron production in proton-proton collisions at $\sqrt{s} = 5.02$ TeV and proton-lead collisions at $\sqrt{s_{\rm NN}} = 5.02$ TeV. The nuclear modification factor, $R_{\rm pA}$, will be employed to provide insights into the internal structure of primary glueball candidate hadrons. The findings of this investigation have the potential to open up a new research domain utilizing the QGP, deepening our understanding of the internal structures of exotic hadrons and their roles in high-energy collisions.

Category

Experiment

Collaboration (if applicable)

The ALICE Collaboration

Primary author: YANO, Satoshi (Hiroshima University (JP))

Presenter: YANO, Satoshi (Hiroshima University (JP))

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