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Study of $f_0(980)$ resonance production in pp collisions at $\sqrt{s} = 13.6$ TeV with ALICE

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To investigate the characteristics of the hadronic phase in proton-proton (pp) and heavy-ion (AA) collisions, short-lived resonances serve as essential probes. Among them, the $f_0(980)$ resonance, with a lifetime of approximately 3–5 fm/c as reported by ALICE, is particularly sensitive to re-generation and re-scattering processes in the hadronic phase, making it highly suitable for such studies. Moreover, its debatable internal structure, potentially corresponding to tetraquark states or meson-meson molecular states, remains of significant physical interest. In this study, $f_0(980)$ resonance was analyzed using data collected with the ALICE detector in pp and p-Pb collisions at LHC energies. It was reconstructed via its main decay channel, $\pi^+\pi^-$, with a particular focus on identifying and reconstructing charged pions. The significant increase in statistics collected at LHC Run 3 enabled a more precise measurement, providing deeper insights into its properties. Furthermore, the production cross section and the ratio of this resonance to the stable hadron yields were studied, complementing the results already obtained in Run 2. This analysis discussed the internal structure of $f_0(980)$ resonance and provides a valuable reference for understanding the properties of the possible hadronic phase in small collision systems.

Consent

Primary author: BAE, Yunseul (Sungkyunkwan University (SKKU))

Presenter: BAE, Yunseul (Sungkyunkwan University (SKKU))

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