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Precision Studies of Strangeness Production in Small Collision Systems with ALICE Run 3

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The study of strangeness production in small collision systems provides crucial insights into the mechanisms governing particle production at the LHC. Recent observations in proton–proton (pp) and proton–lead (p–Pb) collisions have revealed features reminiscent of those seen in heavy-ion collisions, such as collective-like behaviour and strangeness
enhancement, which appear to scale with event multiplicity rather than system size.

With the advent of Run 3, the upgraded ALICE detector enables precision measurements of light-flavour and (multi-)strange hadron production across an extended range of collision energies and multiplicities. This contribution presents recent results from pp collisions at $\sqrt{s}$ = 0.9 TeV and $\sqrt{s}$ = 13.6 TeV, offering an unprecedented opportunity to explore the evolution of strangeness production from the lowest to the highest LHC energies. The measured (multi-)strange-to-non-strange particle yield ratios, reaching multiplicities comparable to those in peripheral Pb–Pb collisions, provide new constraints on strangeness enhancement and its dependence on system size and energy in the precision era of ALICE.

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