ID de Contribution: **103** Type: **Poster**

Investigating strangeness production in pp collisions using hadron-strangeness correlations with ALICE at the LHC

mardi 4 juin 2024 19:30 (1 minute)

One of the key challenges of hadron physics today is understanding the origin of strangeness enhancement in high-energy hadronic collisions, i.e. the increase of (multi-)strange hadron yields relative to non-strange hadron yields with increasing charged-particle multiplicity. The microscopic origin of this phenomenon is still not fully understood: is it related to hard scattering events, such as jets, or instead to particle production mechanisms related to the underlying event? To separate strange hadrons produced in jets from those produced in the underlying event, the angular correlation between high-p_{T} charged particles and strange hadrons has been exploited. The near-side jet yield and the out-of-jet yield of $\mathrm{K}^0_{\mathrm{S}}$ and $\Xi^{\pm}$ have been studied as a function of the multiplicity of charged particles produced in pp collisions at $\sqrt{s} = 13$ TeV and $\sqrt{s} = 5$ TeV. The results show that out-of-jet processes give the dominant contribution to strange hadron production and that the relative production of $\Xi^{\pm}$ with respect to $\mathrm{K}^0_{\mathrm{S}}$ is favoured in out-of-jet processes. Moreover, the increase with multiplicity of the $\Xi^{\pm}/\mathrm{K}^0_{\mathrm{S}}$ yield ratio suggests that strangeness enhancement with multiplicity is observed both in and out of jets. Comparisons with EPOS LHC and PYTHIA 8 model predictions reveal that these models are unable to quantitatively reproduce the measured in- and out-of-jets yields.

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Classification de Session: Posters

Classification de thématique: Light-flavours and Strangeness