Strangeness Production in Proton–Proton Collisions Close to Threshold

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Exclusive data on both the elementary kaon and antikaon production channels have been taken at the cooler synchrotron COSY in proton–proton scattering.
In the kaon–hyperon production an enhancement by one order of magnitude of the Λ/Σ^0 ratio has been observed at excess energies below Q = 13 MeV [1] compared to data at higher excess energies (Q $\geq$ 300 MeV). New results [2] obtained at the COSY–11 facility explore the transition region between the regime of this low–energy Σ^0 suppression and excess energies of 60 MeV. A comparison of the energy dependence of the Λ and Σ^0 total cross sections exhibits distinct qualitative differences between both hyperon production channels.
Studies of kaon–antikaon production have been motivated especially by the ongoing discussion about the nature of the scalar resonances $f_0(980)$ and $a_0(980)$ coupling to the $K\overline{K}$ channel. For the reaction $pp \to ppK^+K^-$ a first total cross section value is reported at an excess energy of Q = 17 MeV [3], i.e. below the ϕ threshold. Calculations obtained within an OBE model indicate that the energy dependence of the available total cross section data close to threshold is rather difficult to reconcile with the assumption of a phase–space behaviour modified predominantly by the proton–proton final state interaction [4].
Recent experimental results obtained at COSY are presented, and physics implications are discussed.

References

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