Chiral dynamics and the reactions $pp \to dK^+\bar{K}^0$ and $pp \to d\pi^+\eta$

E. Oset[a], José A. Oller[b] and Ulf-G. Meißner[b]
[a] *Departamento de Física Teórica and IFIC, Centro Mixto Universidad de Valencia-CSIC Institutos de Investigación de Paterna, Aptad. 22085, 46071, Valencia, Spain*

[b] *Forschungszentrum Jülich, Institut für Kernphysik (Theorie), D-52425 Jülich, Germany*

We perform a study of the final state interactions of the $K^+\bar{K}^0$ and the $\bar{K}^0 d$ systems in the reactions $pp \to dK^+\bar{K}^0$ and $pp \to d\pi^+\eta$. Since the two-meson system couples strongly to the $a_0(980)$ resonance, these reactions are expected to be an additional source of information about the controversial scalar sector. We also show that these reactions present peculiar features which can shed additional light on the much debated meson-baryon scalar sector with strangeness -1. We deduce the general structure of the amplitudes close to the $dK^+\bar{K}^0$ threshold, allowing for primary $K^+\bar{K}^0$ as well as $\pi^+\eta$ production with the two mesons in relative S- or P-wave. The interactions of the mesons are accounted for by using chiral unitary techniques, which generate dynamically the $a_0(980)$ resonance, and the $\bar{K}^0 d$ interaction is also taken into account. General formulae are derived that allow to incorporate the final state interactions in these systems for any model of the production mechanism. We illustrate this approach by considering two specific production mechanisms based on three flavor meson-baryon chiral perturbation theory. It is demonstrated that in this scenario the $\bar{K}^0 d$ interactions are very important and can change the cross section by as much as one order of magnitude. The amount of $\pi^+\eta$ versus $K^+\bar{K}^0$ production is shown to depend critically on the primary mixture of the two mechanisms, with large interference effects due to final state interactions. These effects are also shown to occur in the event distributions of invariant masses which are drastically modified by the final state interactions of the two-meson or the $\bar{K}d$ system. The results reported here have been recently published in ref. [1].

References

1. E. Oset, José A. Oller and Ulf-G. Meissner, Eur. Phys. J. A12 (2001) 435-446.