Hyperon polarization in a quark-quark scattering model

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The large polarization observed in inclusive hyperon production in proton-proton collision remains a mystery after almost 30 years following the first reported measurements. Many models have been proposed since then that attempt to explain the hyperon polarization behavior but no model has succeeded in explaining the collective systematics.

In the present work the authors propose that inclusive hyperon polarization effects from p-p scattering can be explained in the framework of a simple model where quarks become polarized as a result of a direct quark-quark scattering process. All quarks associated with the inclusive hyperon production process are assumed to be present prior to the collision, with the required non-valence quarks being derived from pre-collision q-qbar production. Support for the concept comes from the ability of the model to explain Λ inclusive polarizations using data from p-p polarization, and its ability to successfully relate the Λ, Σ, Ξ and Ω inclusive polarizations using only the assumption that it is the more massive s-quark being scattered. The idea that multiple quark scattering can explain complicated polarization patterns was first reported in the work of Neal and Nielsen in a previous publication. The remarkably good agreement obtained with these minimal assumptions suggests the possibility that the large hyperon polarizations are no more a mystery than the proton-proton polarization itself, and that the two may be related and have a simple and common origin.

Planned measurements of the inclusive Λ_b polarization at the LHC will be described and the model predictions will be presented.