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Hard diffraction in ATLAS

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Hard diffraction processes, characterized by the exchange of a color-neutral object (such as a Pomeron) between colliding protons, offer a unique window into the interplay between perturbative and non-perturbative QCD. In particular, the study of hard diffraction is of significant interest, as these processes occur at high momentum transfer (Q^2) and probe the mechanisms underlying diffractive interactions in the perturbative regime. Such measurements provide crucial insights into the nature of the Pomeron and the partonic structure involved in diffraction.

The feasibility of these measurements is greatly enhanced by the ATLAS Forward Proton (AFP) detectors, which are optimized to detect protons scattered at small angles while retaining most of their initial energy—a characteristic signature of diffractive interactions, where the proton may remain intact after the collision. By tagging these forward-scattered protons, AFP allows for a clean identification of diffractive events. Combined with the comprehensive particle detection and reconstruction capabilities of the ATLAS detector, this setup provides a robust framework for studying diffractive processes.

These studies enhance our understanding of the Pomeron's role in high-energy collisions and provide valuable insights into the structure of protons in diffractive interactions. The findings have important implications for both theoretical models of diffraction and future experimental developments in particle physics.

In my talk, I will introduce the AFP detector system and discuss the feasibility of measuring hard diffractive processes, specifically those involving jets and open charm production.

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