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Forward-Backward Asymmetry as a Discovery Tool for Z' Bosons at the LHC

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The Forward-Backward Asymmetry (AFB) in Z' physics is commonly only perceived as the observable which possibly allows one to interpret a Z' signal by distinguishing different models of such (heavy) spin-1 bosons. In this paper, we examine the potential of AFB in setting bounds on or even discovering a Z' at the Large Hadron Collider (LHC) and show that it might be a powerful tool for this purpose. We analyse two different scenarios: Z'-bosons with a narrow and wide width, respectively.
We find that, in the first case, the significance of the AFB search can be comparable with that of the bump search usually adopted by the experimental collaborations; however, being a ratio of (differential) cross sections the AFB has the advantage of reducing systematical errors. In the second case, the AFB search can win over the bump search in terms of event shape, as the structure of the AFB distribution as a function of the invariant mass of the reconstructed Z'-boson could nail down the new broad resonance much better than the event counting strategy usually adopted in such cases.

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