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Parton Showers with higher logarithmic accuracy

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Parton shower event generators are essential tools for establishing the quantitative connection between theory and experiment. However, their flexibility comes with a trade-off: they generally offer lower formal accuracy compared to state-of-the-art analytic calculations, which in turn have more limited applicability. The poor accuracy of the inevitably employed parton shower generators introduces systematic uncertainties that affect all measurements at colliders. In this talk, I will dis- cuss the efforts made by the PanScales collaboration to improve the logarithmic accuracy of parton showers. Until recently, this accuracy was limited to the leading logarithms. Specifically, I will demonstrate how we can achieve Next-to-Leading Logarithm (NLL) accuracy. Furthermore, I will explore advancements beyond NLL. These developments are crucial for refining our understanding of fundamental particle interactions and reducing uncertainties in present and future collider measurements.

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