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Multi-dimensional measurements of the parton shower in pp collisions at RHIC

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Jets are collimated sprays of hadrons and serve as an experimental tool for studying the dynamics of quarks and gluons. In particular, differential measurements of jet substructure enable a systematic exploration of the parton shower evolution. The SoftDrop grooming technique utilizes the angular ordered Cambridge/Aachen reclustering tree and provides a correspondence between the experimental observables such as the shared momentum fraction (z_g), groomed jet radius or split opening angle (R_g) and the QCD splitting functions in vacuum. In this poster, we present fully corrected correlations between z_g and R_g at the first split for jets of varying momenta and radii in pp collisions at $\sqrt{s} = 200$ GeV. To study the evolution along the jet shower, we also present the splitting observables at the first, second and third splits along the jet shower for various jet and initiator prong momenta. As these novel measurements are presented in three dimensions, we outline the correction procedure so that it can be used as a template for future multi-differential measurements across all experiments.

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