

1 Differential measurements of jet sub-structure
2 observables and their correlation in p+p collisions
3 at $\sqrt{s} = 200$ GeV in STAR

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5 Jets can serve as an experimental tool for studying quantum chromodynam-
6 ics. In particular, we can explore the properties of parton shower and evolution
7 by measuring jet sub-structure. One of the techniques that allows experimental
8 access to the parton shower is the jet grooming technique called SoftDrop. This
9 analysis extends recent measurements of the jet sub-structure observables based
10 on the SoftDrop algorithm in p+p collisions at $\sqrt{s} = 200$ GeV in the STAR ex-
11 periment, including groomed radius (R_g) and shared momentum fraction (z_g).
12 We present fully corrected multi-differential measurements of jet sub-structure
13 observables at the first split and their correlations via z_g vs. R_g for the first
14 time for jets of different transverse momenta and radii. We show that z_g has
15 a strong dependence on R_g and a weak dependence on jet transverse momen-
16 tum. We compare our measurements to the state-of-the-art Monte Carlo mod-
17 els. We discuss the impact of variations in parton shower (perturbative) and
18 hadronization/underlying-event (non-perturbative) modeling on the measured
19 correlations between sub-structure observables. We will also preview upcoming
20 measurements that explore the splitting scale (k_T) and groomed mass fraction
21 (μ) in our differential framework.