

1 First measurements of the jet mass in p+p collisions at  $\sqrt{s} = 200$  GeV  
2 at STAR

3 Isaac Mooney for the STAR Collaboration  
4 Wayne State University

4 **Abstract**

5 Partonic energy loss in a hot, dense QCD medium may be dependent on the parton's virtuality. In this talk,  
6 we present the first measurements of a related observable called the jet invariant mass,  $M$ , in p+p collisions  
7 at  $\sqrt{s} = 200$  GeV at STAR. We also present the SoftDrop groomed mass,  $M_g$ , for which the contribution of  
8 wide-angle non-perturbative radiation is suppressed, facilitating comparisons with Monte Carlo simulations.  
9 The measurements are differential in both the jet transverse momentum,  $p_T$ , and jet radius parameter,  $R$ .  
10 After fully correcting for detector effects, we compare our jet mass and groomed mass results to leading-order  
11 Monte Carlo event generators PYTHIA and HERWIG, which differ both in parton shower and hadronization  
12 mechanisms. We find that PYTHIA6 tuned to RHIC kinematics agrees well with the measurement, while the  
13 corresponding LHC tunes for PYTHIA8 and HERWIG7 have significant disagreement with the data. Such a  
14 comparison presents an opportunity for further tuning of Monte Carlo event generators. Study of the jet mass  
15 in p+p collisions will serve as a baseline for future work in p+A and A+A collisions to explore cold and hot  
16 nuclear matter effects.