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Boosted Jets at the LHC

ANDREW LARKOSKI, Massachusetts Institute of Technology

Jets are collimated streams of high-energy particles ubiquitous at any particle collider experiment and serve as proxy for the production of elementary particles at short distances. As the Large Hadron Collider at CERN continues to extend its reach to ever higher energies and luminosities, an increasingly important aspect of any particle physics analysis is the study and identification of jets, electroweak bosons, and top quarks with large Lorentz boosts. In addition to providing a unique insight into potential new physics at the tera-electron volt energy scale, high energy jets are a sensitive probe of emergent phenomena within the Standard Model of particle physics and can teach us an enormous amount about quantum chromodynamics itself. Jet physics is also invaluable for lower-level experimental issues including triggering and background reduction. It is especially important for the removal of pile-up, which is radiation produced by secondary proton collisions that contaminates every hard proton collision event in the ATLAS and CMS experiments at the Large Hadron Collider. In this talk, I will review the myriad ways that jets and jet physics are being exploited at the Large Hadron Collider. This will include a historical discussion of jet algorithms and the requirements that these algorithms must satisfy to be well-defined theoretical objects. I will review how jets are used in searches for new physics and ways in which the substructure of jets is being utilized for discriminating backgrounds from both Standard Model and potential new physics signals. Finally, I will discuss how jets are broadening our knowledge of quantum chromodynamics and how particular measurements performed on jets manifest the universal dynamics of weakly-coupled conformal field theories.