

Study of jet substructure observables for reconstructing boosted Higgs boson

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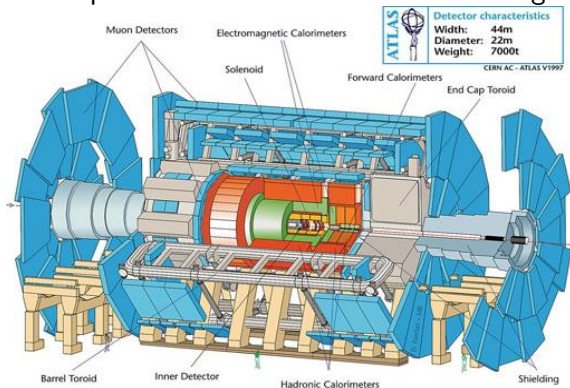
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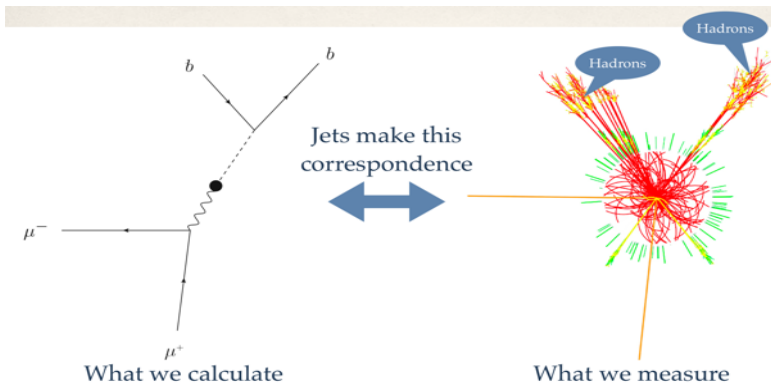
- 1 The LHC and ATLAS Detector
- 2 Jets
- 3 Boosted Jets
- 4 Substructure Variables
- 5 Results
- 6 Conclusion

The ATLAS Detector

- 1 Protons collide at the centre of detector and debris of new particles are scattered in all directions.
- 2 Made up of six different sub-detectors arranged in layers.

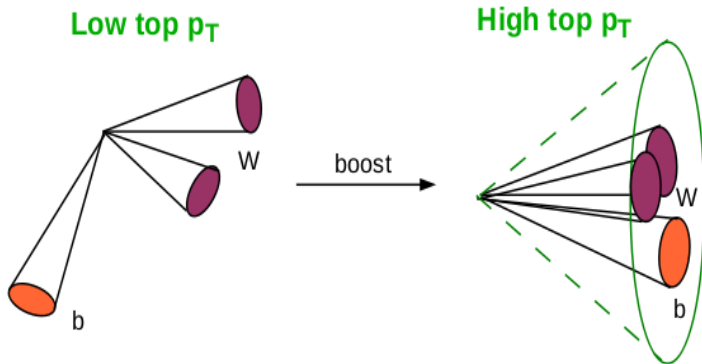


- 1 streams of hadrons that are produced during proton-proton collision from quarks or gluons through the process of hadronization
- 2 Jet reconstruction algorithms



Boosted Jets

- 1 Production of particles with transverse momentum that is much larger than their mass.
- 2 Collect the jets into a single fat jet



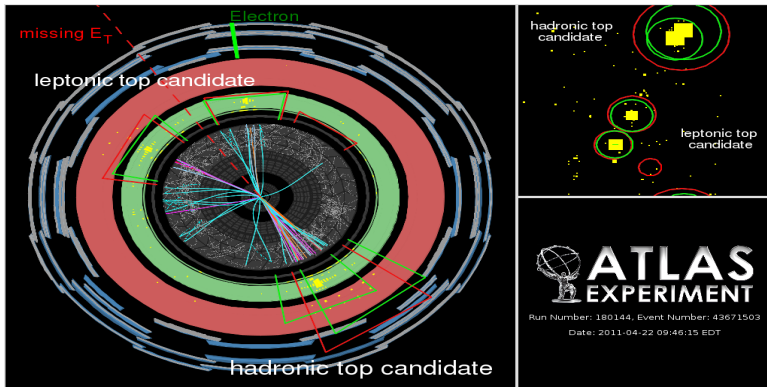
1. Mass

- 1 Reconstruct the Mass from jets
- 2 We should be able to see the higgs boson mass from the invariant mass distributions plot

2. N-Subjettiness

- 1 Designed to identify boosted hadronically-decaying objects like electroweak boson and quarks
- 2 Sensitive to what degree the substructure of a given jet resembles two or one subjets

Event display



Substructure observables using simulated ATLAS data set at center of mass of 13TeV of boosted Higgs boson and multi-jet and a hadronic top background

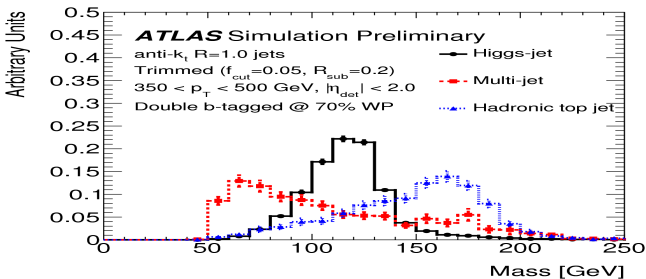


Figure : Mass distribution in the large- R jet transverse momentum ranges $350 \text{ GeV} < p_T < 500 \text{ GeV}$ for Higgs-jets and multi-jet and hadronic top backgrounds. Higgs bosons are simulated with a mass of 125 GeV.

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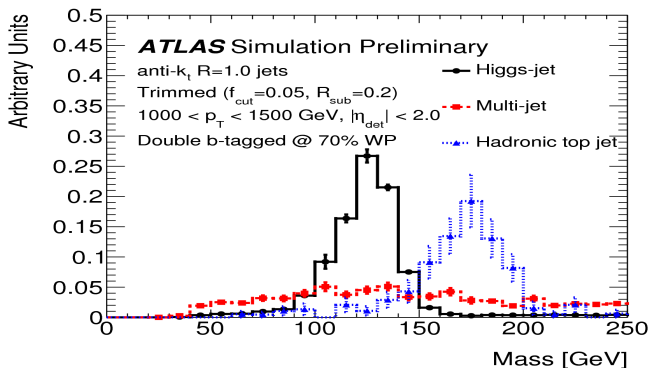


Figure : Mass distribution in the large- R jet transverse momentum ranges $1000 < \text{GeV } p_T < 1500$ GeV for Higgs-jets and multi-jet and hadronic top backgrounds. Higgs bosons are simulated with a mass of 125 GeV.

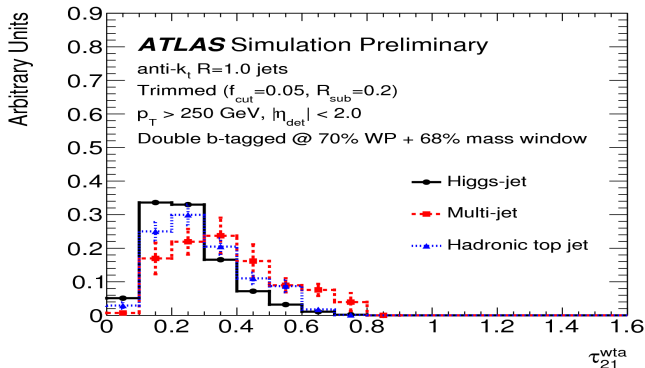
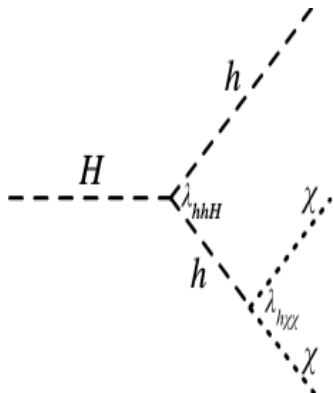


Figure : Distributions of τ_{21}^{WTA} for Higgs-jets (black), multi-jet (red) and hadronic top (blue).

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- 1 The methods used to reconstruct the Higgs boson (Higgs-jet) and hadronic top for the obtained results are directly applicable for identifying other massive particle channels at the LHC.
- 2 To identify boosted scalar H with mass 270 GeV decay channels, the performance of these substructure variables should be similar



Thank you