MEASUREMENT OF W BOSON ANGULAR DISTRIBUTIONS IN EVENTS WITH HIGH P_T JETS WITH ATLAS AT 8 TEV

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Introduction

- High p_T jets can emit a real W collinearly
  - Since the W is massive, they are emitted at a small but non-zero angle relative to the jet
  - Never been directly measured before
  - By looking at the angular distance between the W and the jet, one can explicitly focus on the collinear emission process
  - Very large corrections to LO in collinear region

- Active area of interest amongst theorists with different approaches providing significantly different predictions
  - Weak showering
  - Multi-leg matrix elements for W + jets
  - NNLO calculation of W + ≥ 1 jet
  - An irreducible background for boosted top tagging and other searches for new physics
  - This process will become extremely common at future higher energy colliders

Fiducial selection

- At least one jet with p_T > 500 GeV and |η| < 2.1
- Exactly one muon with p_T > 25 GeV and |η| < 2.4
- Jet with p_T > 100 GeV and |η| < 2.1 closest to the muon is called ‘closest jet’
- Distance between muon and closest jet

Differential cross-section results

- Compared to theory calculations:
  - ALPGEN+PYTHIA6: multi-leg LO
  - PYTHIA8: includes dijet events with weak showering
  - SHERPA+OpenLoops: includes NLO QCD+EW corrections
  - W + ≥ 1 jet NLO: NNLO: calculation up to O(a_s^2)

- Also looked into differential cross-section for events with a leading jet p_T > 650 GeV and for 500 GeV < p_T < 600 GeV

- As leading jet p_T increases, collinear fraction increases and collinear peak shifts to lower ΔR.