Climbing, Dark Matter and the Resolution of Jet Energy.

Rebecca Pickles

December 21, 2015

MANCHESTER 1824
The University of Manchester

A bit about me:

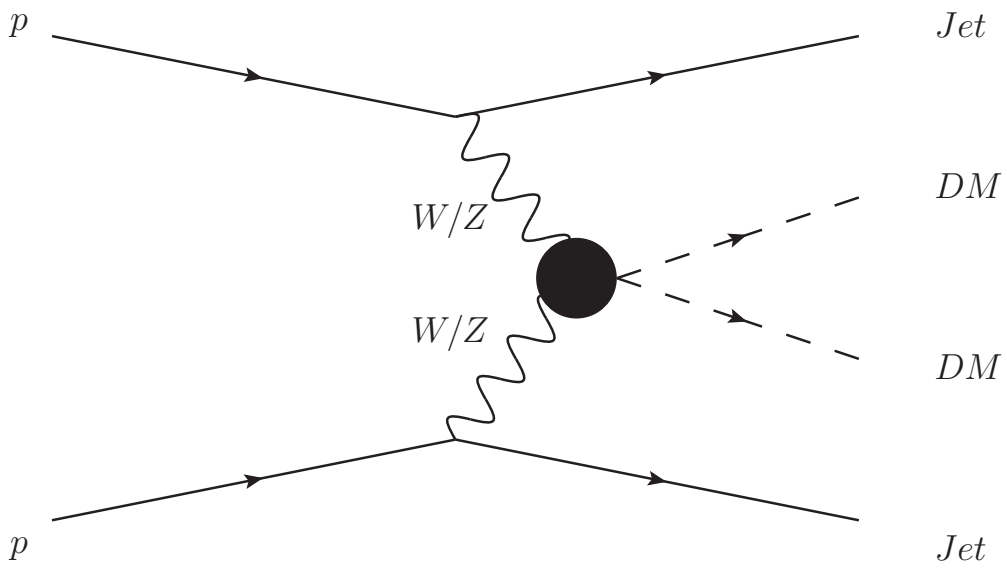
- First year PhD student (Started in September)
- Completed my Undergraduate degree here at Manchester.
- MPhys Project was on DUNE.

Non-academic / Climbing:




Vector Boson Fusion Dark Matter Models

Using weak boson fusion as a mechanism for the production of exotic particles, such as dark matter and neutrinos at the ATLAS experiment at the LHC.



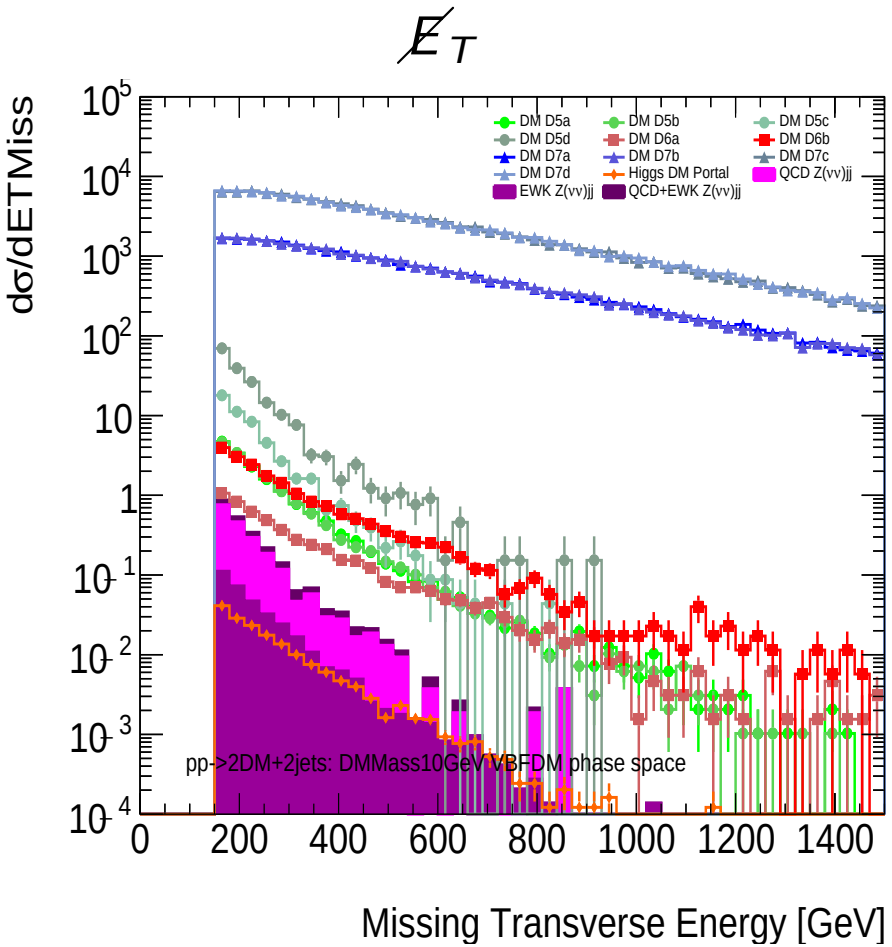
Dark Matter Models

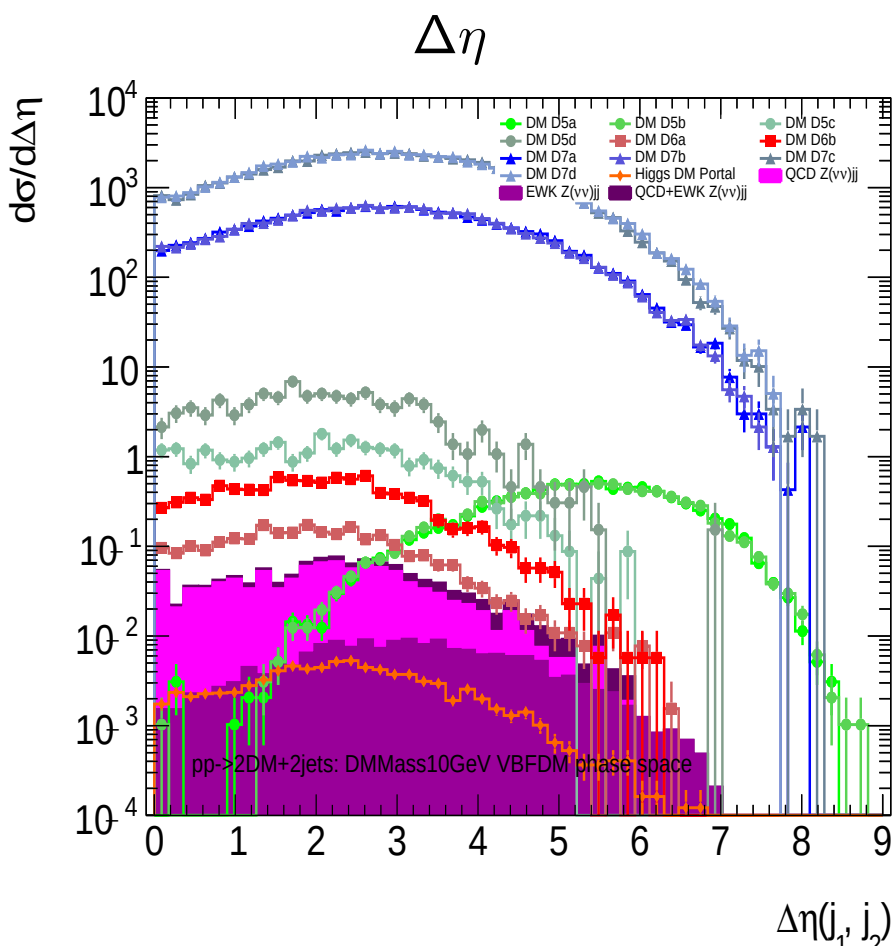
- Looking at effective field theories to produce models of DM events in the ATLAS detector.
- Using and analysing these generated DM events to establish sensitivity.

Long Term Plan:

- Use this mechanism to look for the origin of the neutrino mass and other electroweak phenomena.

DM Plot Examples



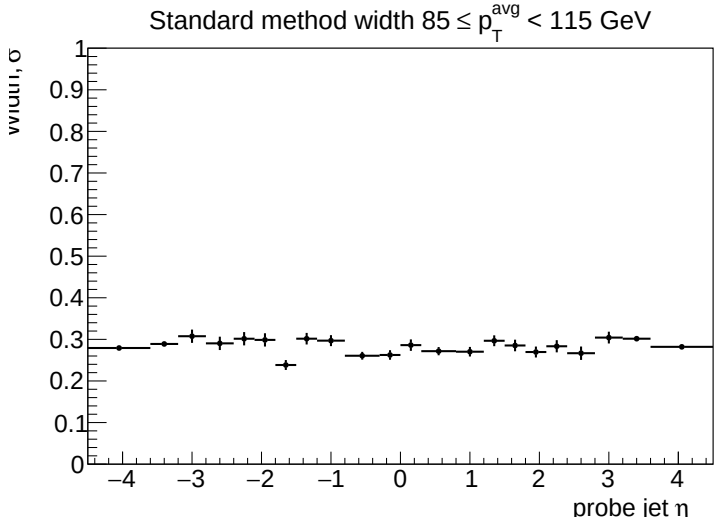


Qualifiation Task: Jet Energy Resolution

Determining the jet resolution from data to make precise jet measurements.

This measurement is vital for:

- The measurement of the cross-sections of Jets, dijets, mulitjets and vector bosons accompanied by jets.
- Top-quark cross-sections and mass measurements.
- Determination of missing transverse energy.



Jet Pt Asymmetry Width

- Used the fit of the asymmetry of the Pt of jets.
- Found the Width of this asymmetry.

- Then find the Jet Resolution using: $\sigma(A) = \frac{1}{\sqrt{2}} \frac{\sigma(p_T)}{p_T}$

Next Steps...

- Continue with Jet Energy Resolution Work.
- Look at DM Phenomenology studies.
- Prepare for ATLAS DM search for Spring-Summer 2016
- Expand to look at other new physics signatures in VBF, such as lepton number/flavour violating processes:
  - Heavy Majorana neutrinos
  - Doubly charged Higgs
  - etc.

Merry Christmas!