HLT Paths for VBF Higgs Study

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Introduction & Motivation

- New HLT Paths have been developed and deployed with the aim of studying VBF Higgs Invisible decay
- Two paths currently online:
  - HLT_DiPFJet40_PFMETnoMu65_MJJ600VBF_LeadingJets_v*
  - HLT_DiPFJet40_PFMETnoMu65_MJJ800VBF_AllJets_v*
- Fluctuation in the rate of this HLT Paths was observed and needed to be explained.
- Looking at the reconstructed objects in order to validate the triggers from an offline point of view.

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Run Selection

- Selected biggest run from each fill since ECAL spike cleaning got turned on again.
  - No official certification available at the time
- Run List: 190895, 190906, 190949, 191062, 191086, 191202, 191226, 191247, 191264, 191277, 191700, 191718, 191811, 191830

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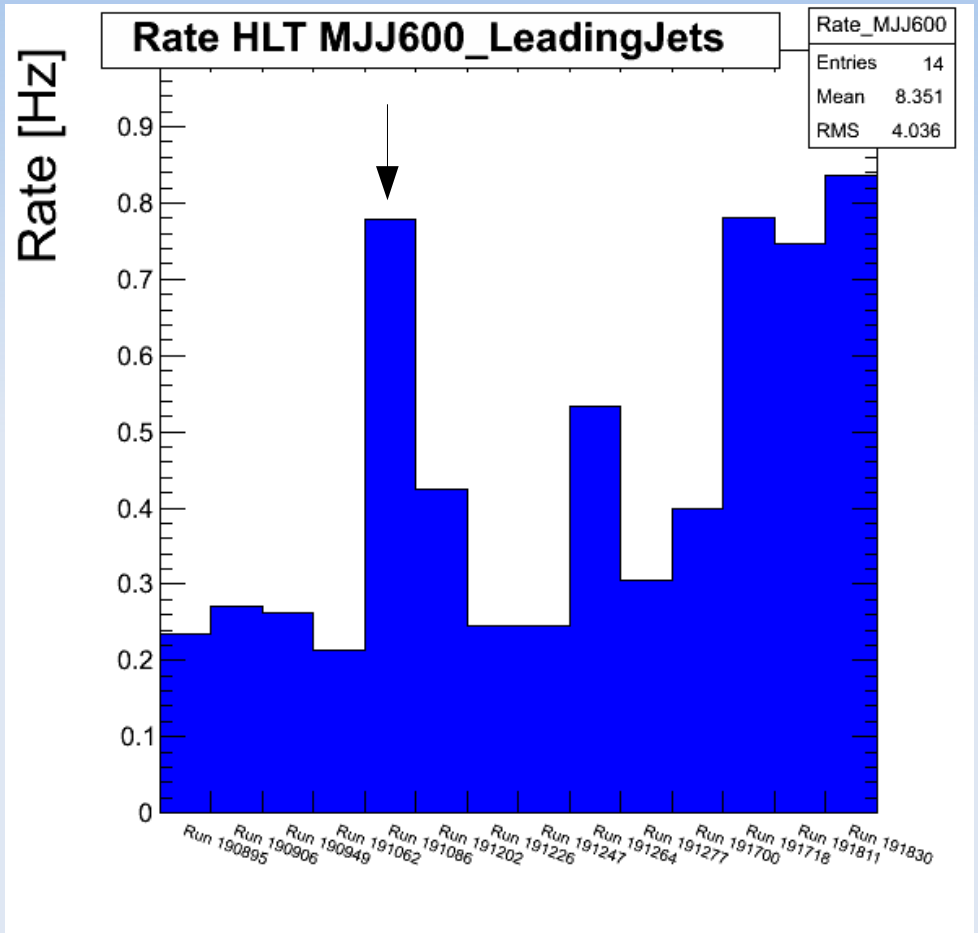
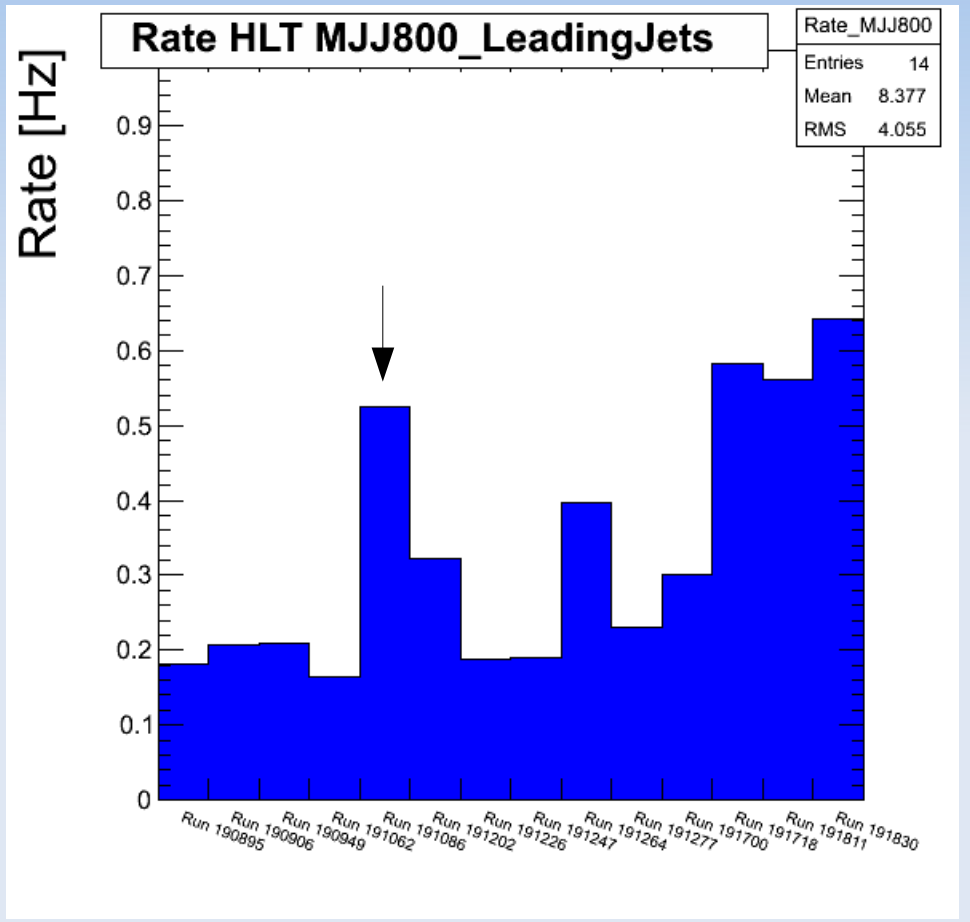
HLT Rates





Rate increased with the ramping of instant luminosity and pileup.

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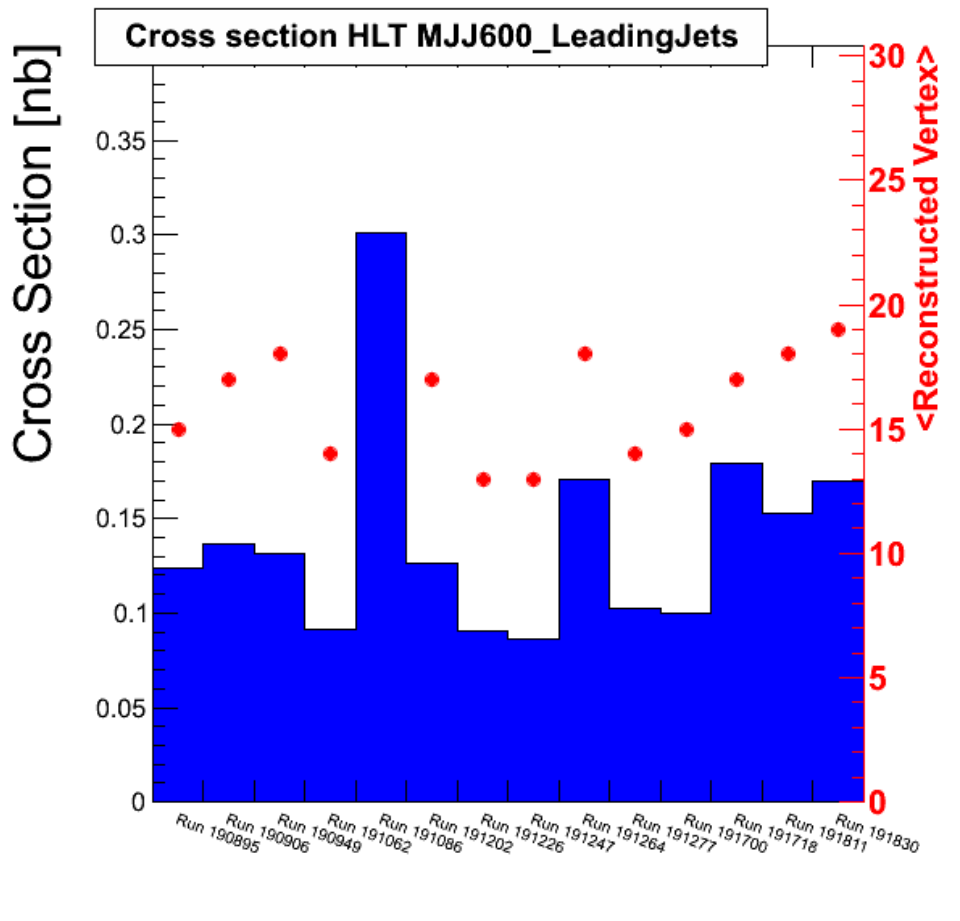
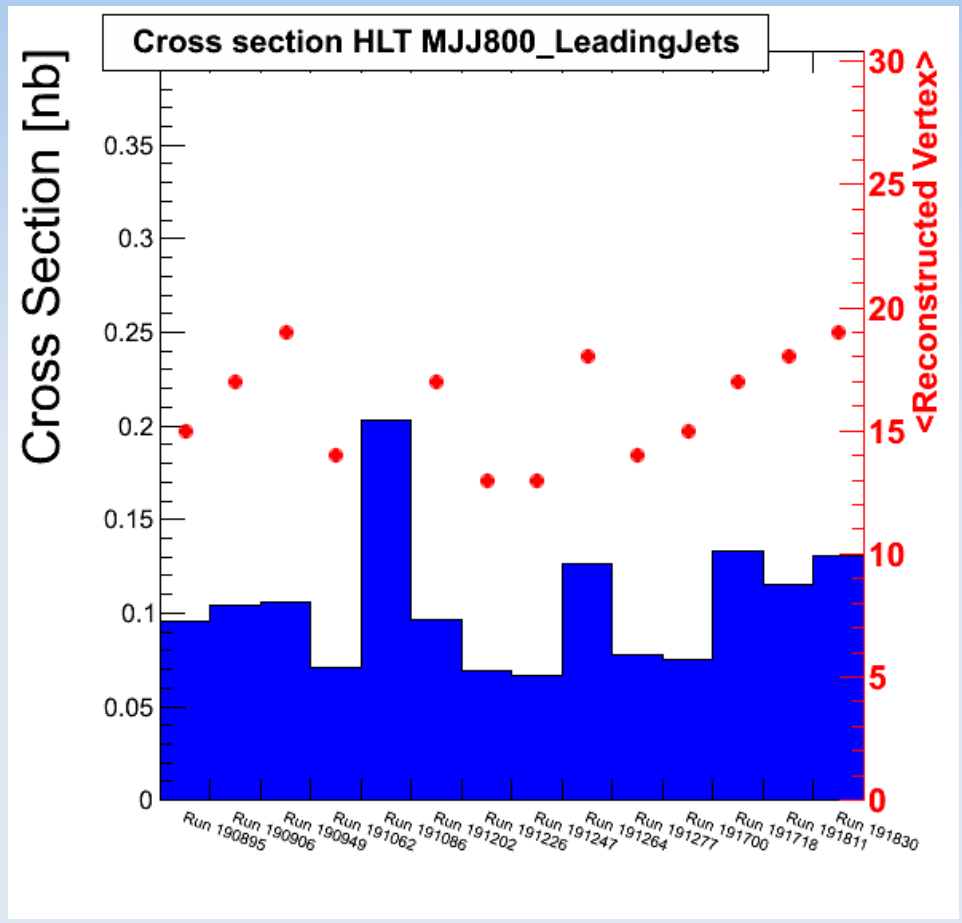
HLT Cross Sections





We can see a correlation between <PU> and Cross Section Variations. Also the problematic run shows no Vertex (found Pixels were off)

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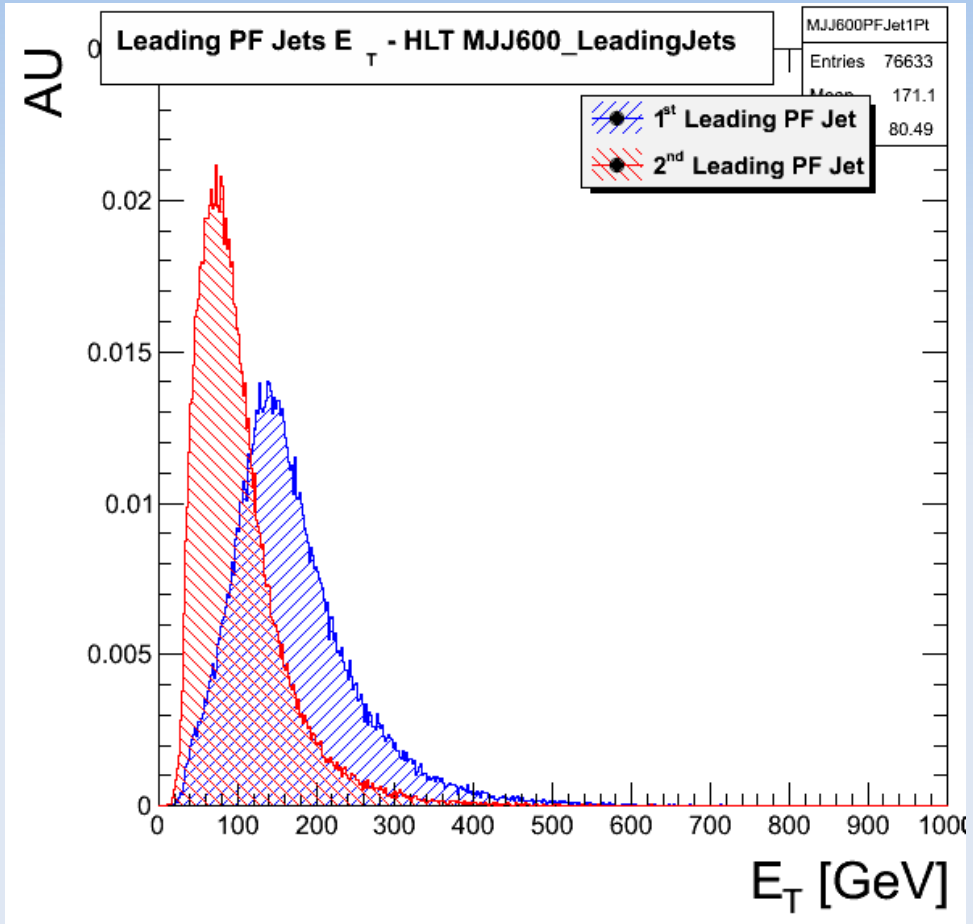
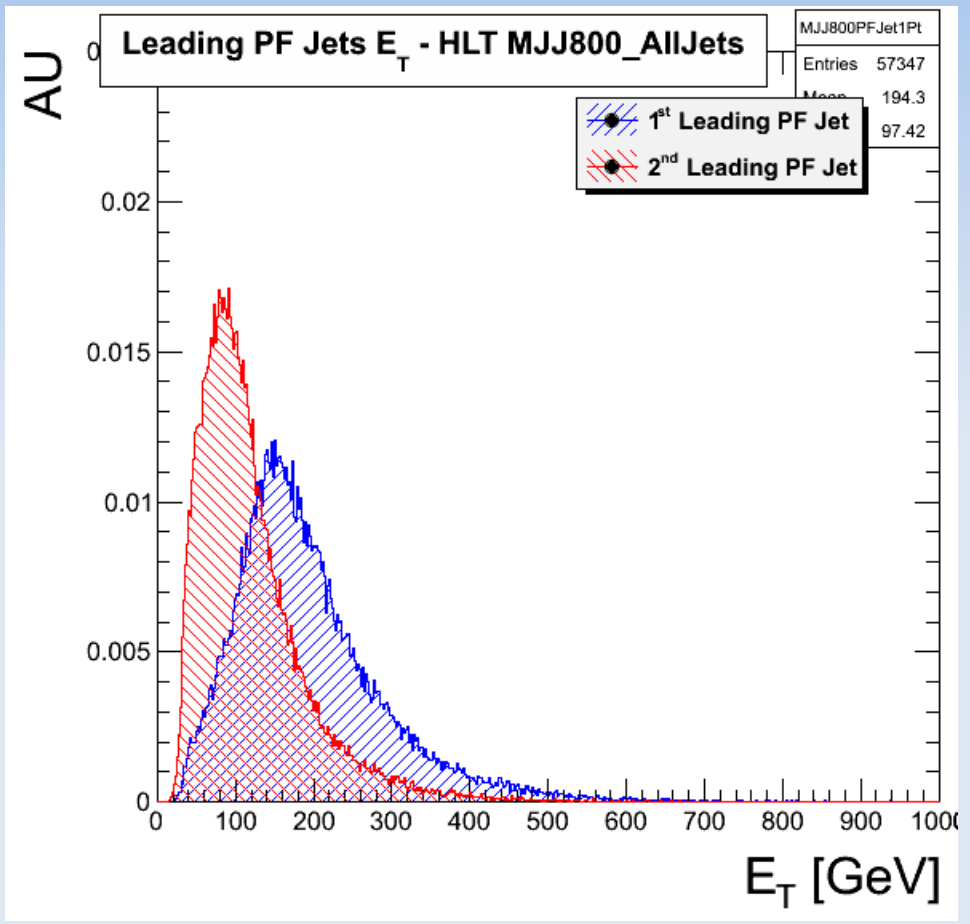
Jet pT





- As expected 2nd Jet peaks at a much lower pT.

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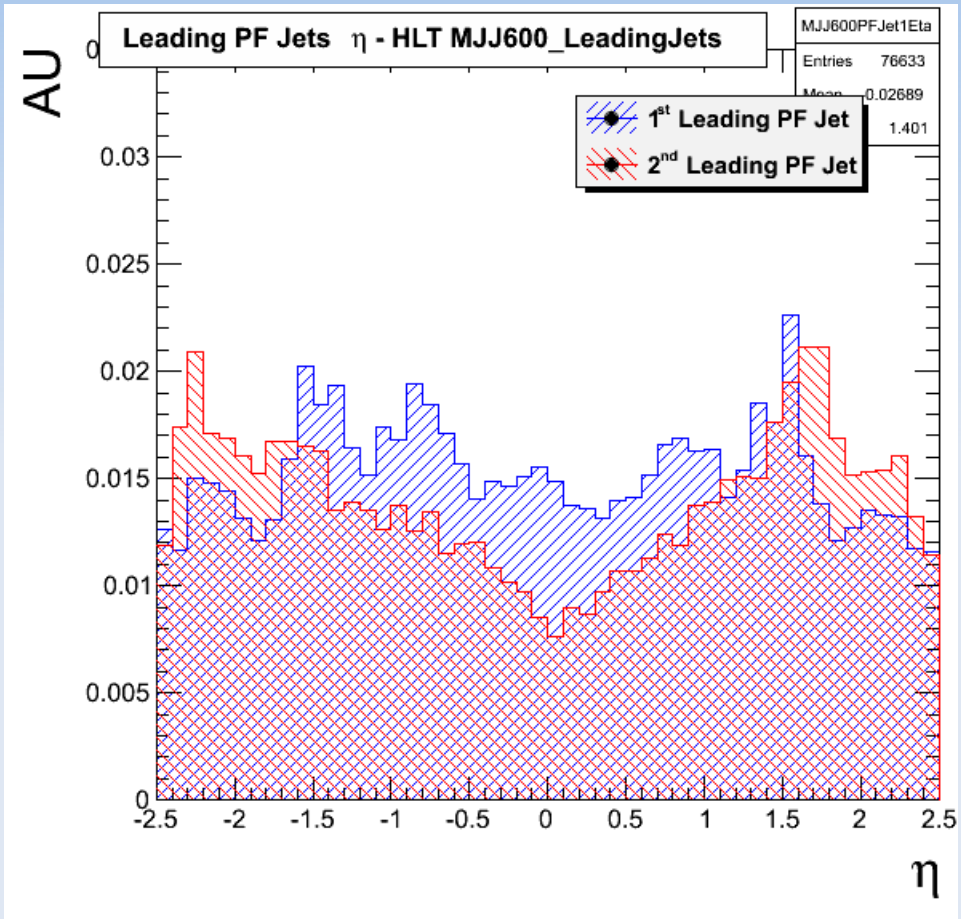
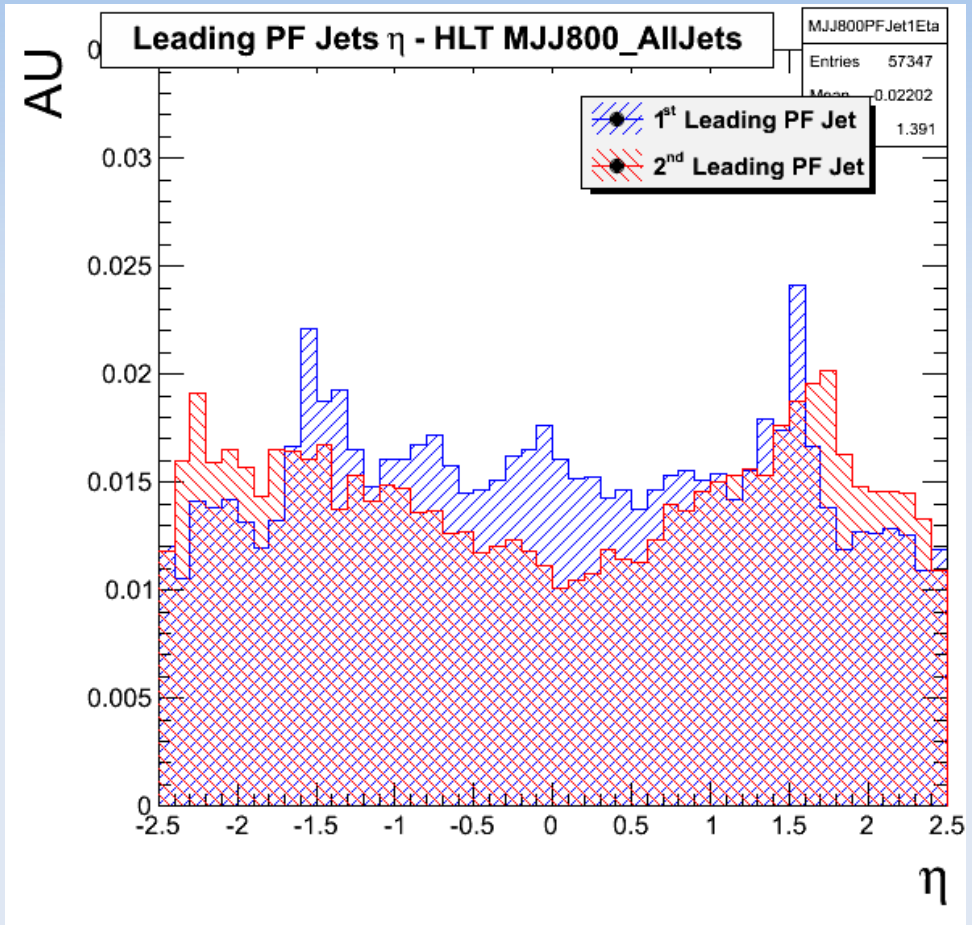
Jet Eta





- Some asymmetry and spikiness that needs further investigation.

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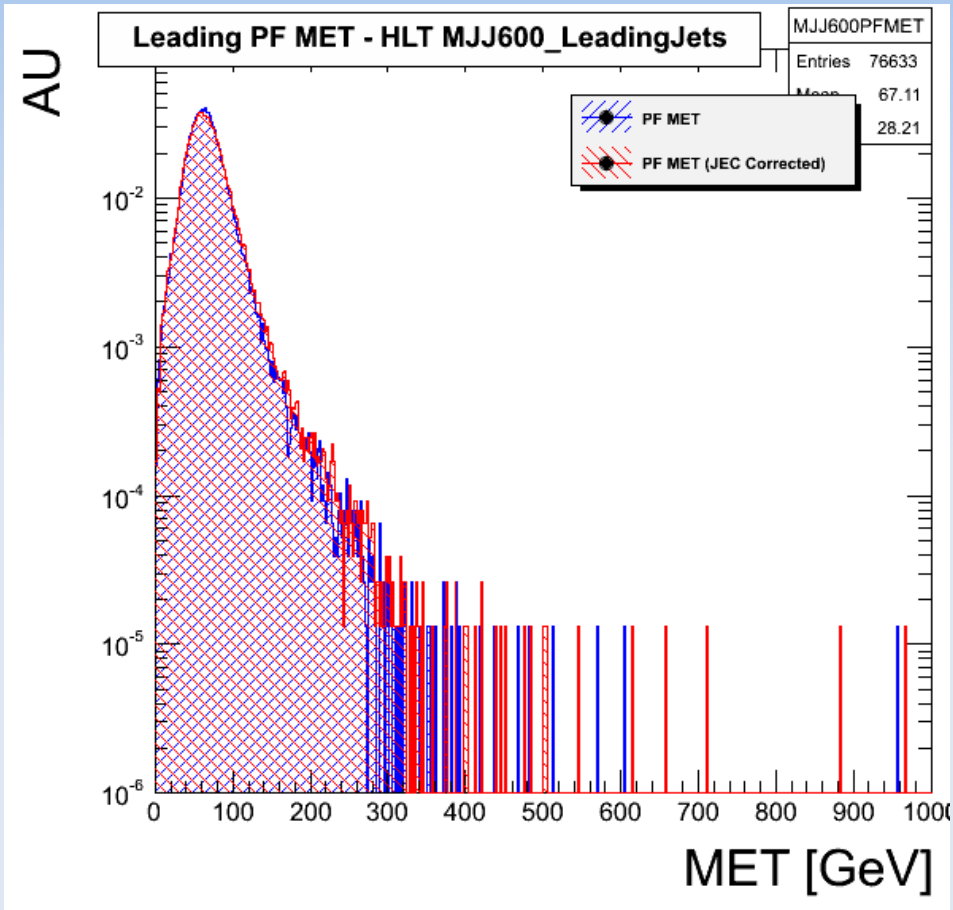
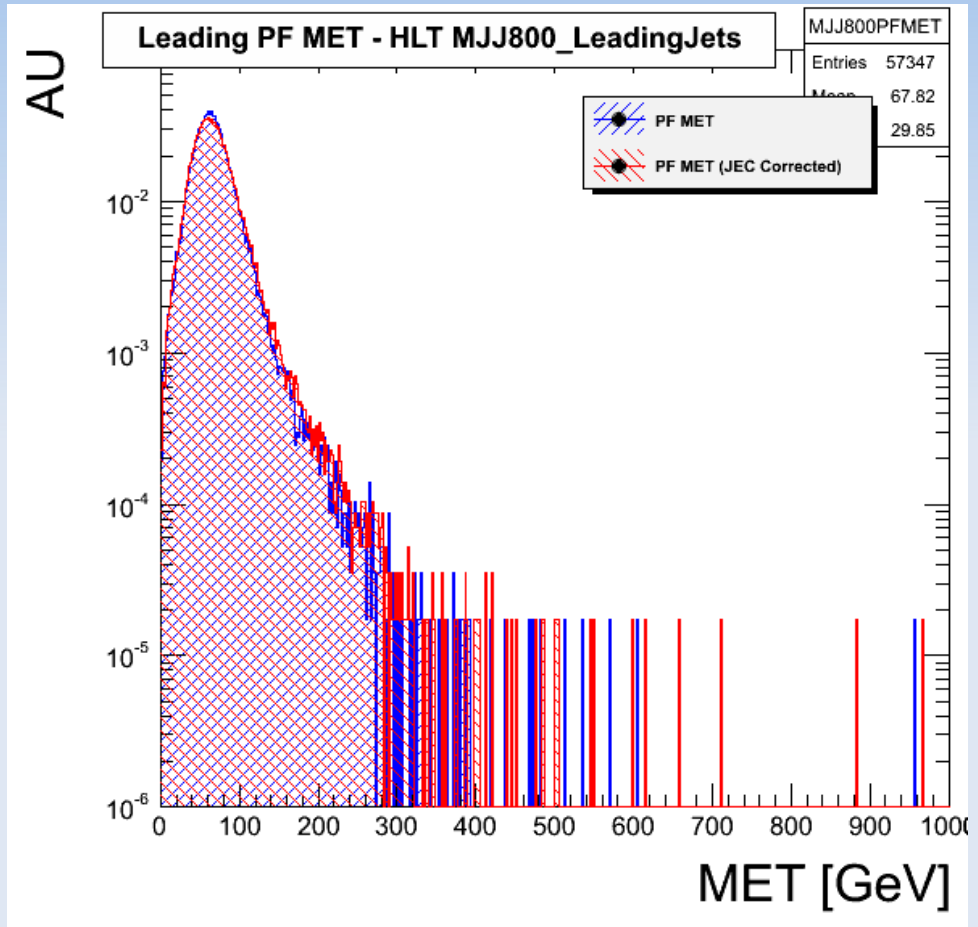
MET





- Apparently Corrected MET differs more at High eT, will look into this.

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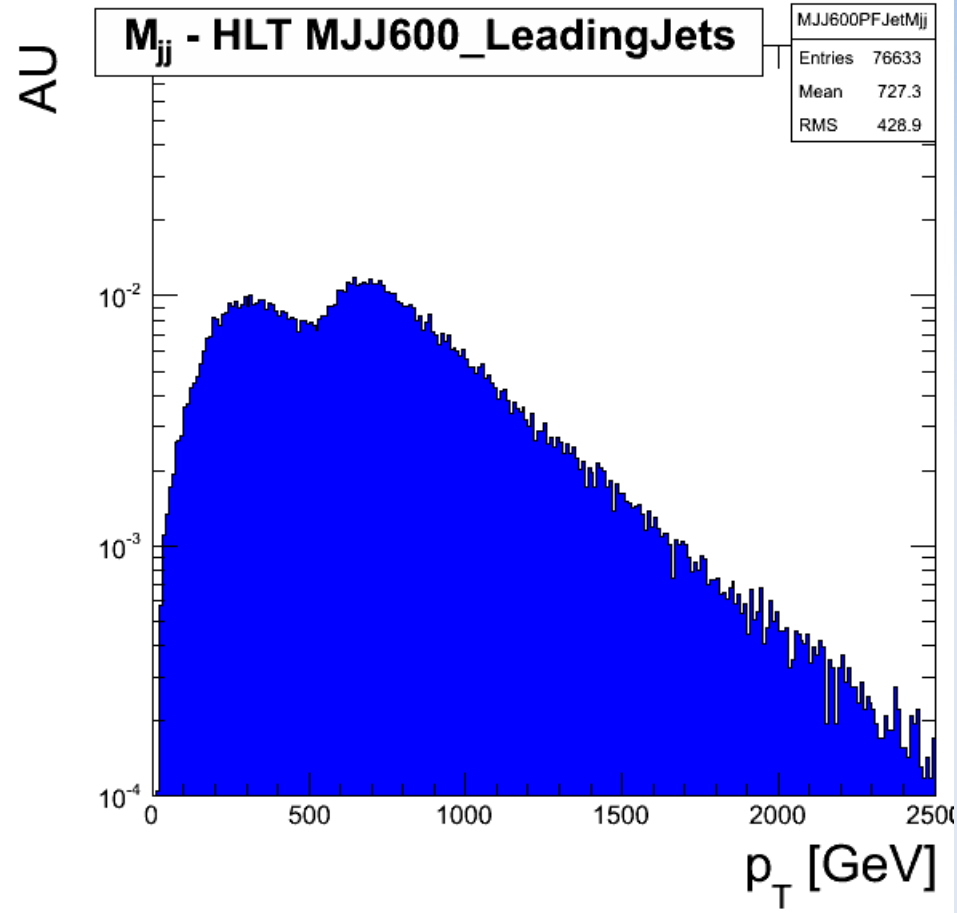
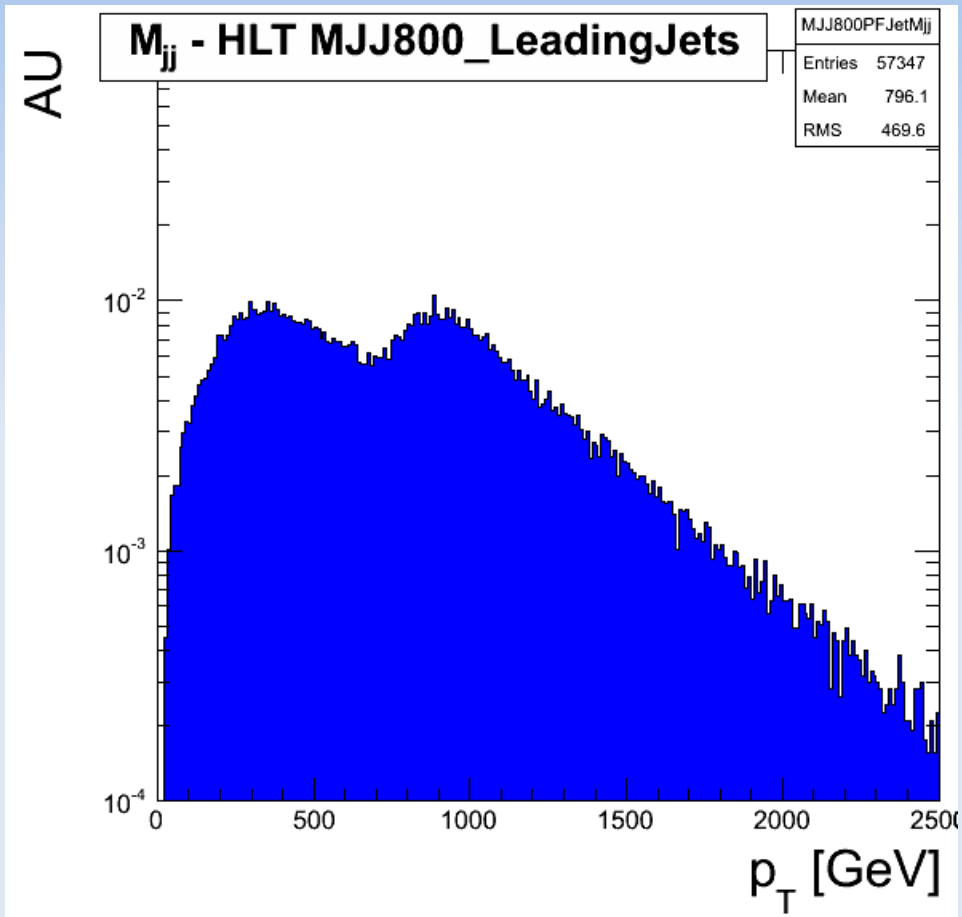
Leading Jet Invariant Mass





- 2 distributions in each plot:
  - Leading jets == HLT Mjj selected jets
  - Leading jets != HLT Mjj selected jets

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Conclusions

- Found the reason for the variation of HLT Path rate, it's mainly due to PU.
- Basic reco variables seem to validate the HLT Paths, but further study should be done.
- Some indications that we should use PF MET Type 1 Corrected specially for high MET events.
- Next study of HLT objects and their matched reco objects.

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