UCL

b-Trigger Efficiencies in 2016

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Di-b-jet Meeting

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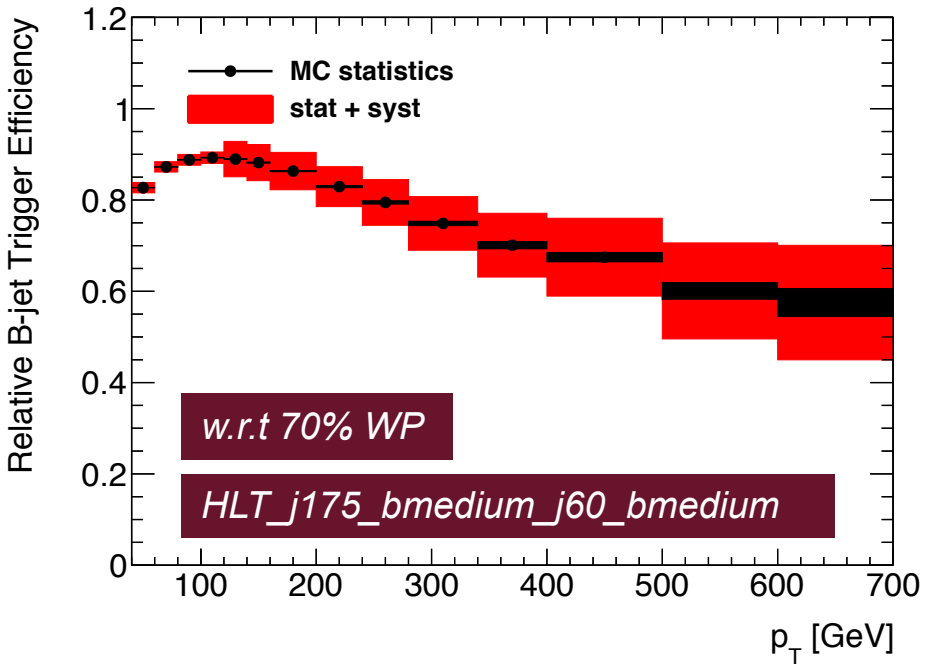
b-Jet Triggers: Introduction

- **b-Jet Triggers to get to low masses**
  - 2015 data: IP3D+SV1 Algorithm
  - 2016 data: mv2c20 online alg.
- **HLT_j150_bmv2c2060_split _j50_bmv2c2060_split**
- **77% Eff Offline WP.**
- **b-Jet Trigger Strategy**
  - Derive b-Jet Trigger Efficiencies
    - Data driven technique using high b-purity dilepton ttbar sample
  - Efficiencies are applied to signal samples to emulate trigger
  - Not required for background - Exact light-jet and c-jet rejections not needed
    - Use fit to model background rather than MC



$$\text{b-Jet Trig Eff. wrt offline} = \frac{\text{\# b-Jets pass offline and online b-tagging}}{\text{\# b-Jets offline b-tagging}}$$

b-Jet Triggers: Event Selection

- **High purity b-jet sample: Di-lepton tt selection**
  - **Single lepton bperf trigger**: *HLT_(mu26_imedium/e26_tight_iloose/e26_lhtight_iloose)_2j35_bperf*
    - Calculate online b-tagging algorithms on all jets with p_T > 35 GeV
  - **1 medium electron & 1 medium muon** (p_T > 30 GeV)
  - **2 b-tagged jets**, MV2c10 *(p_T > 50 GeV, $|\eta|$ < 2.5)*

Need to double check these cuts.

b-Jet Triggers (2015 run)

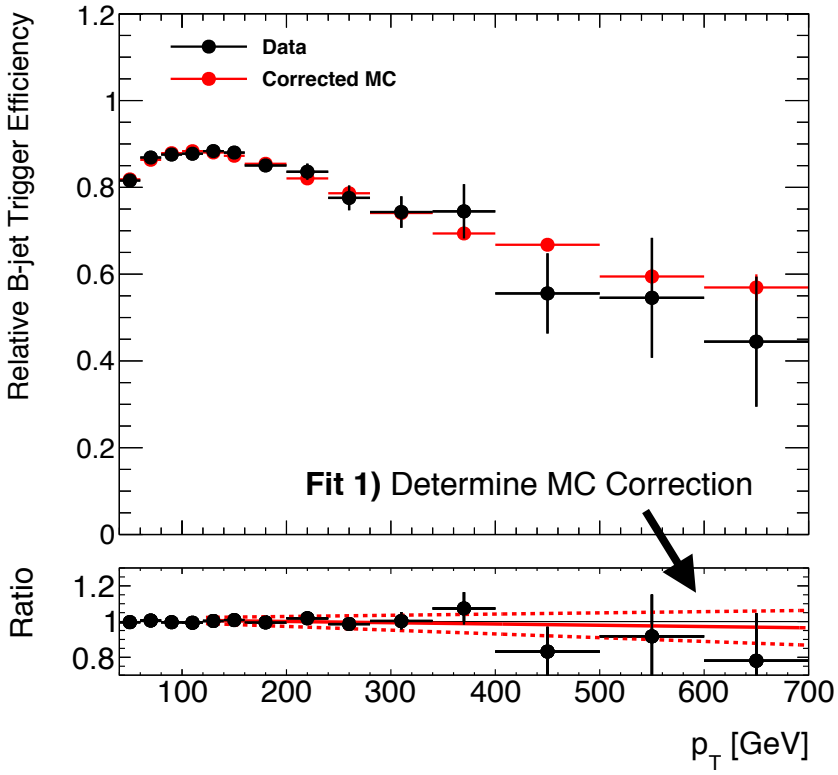
Jet p_T < 120 GeV

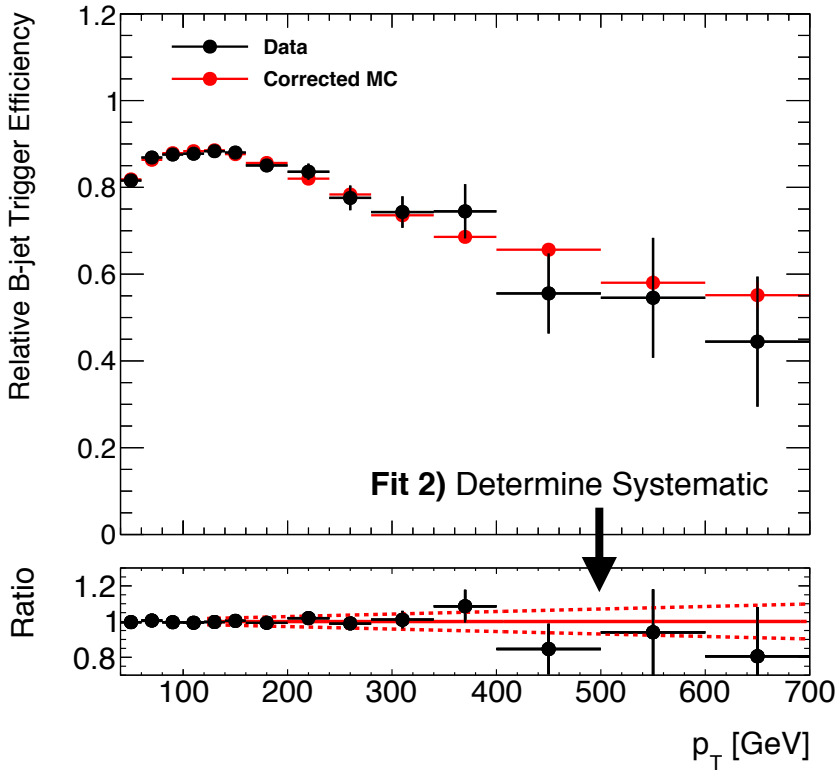
- **Data Eff. taken as central value**

- Data/MC difference taken as syst.
- Precision of data also as syst.

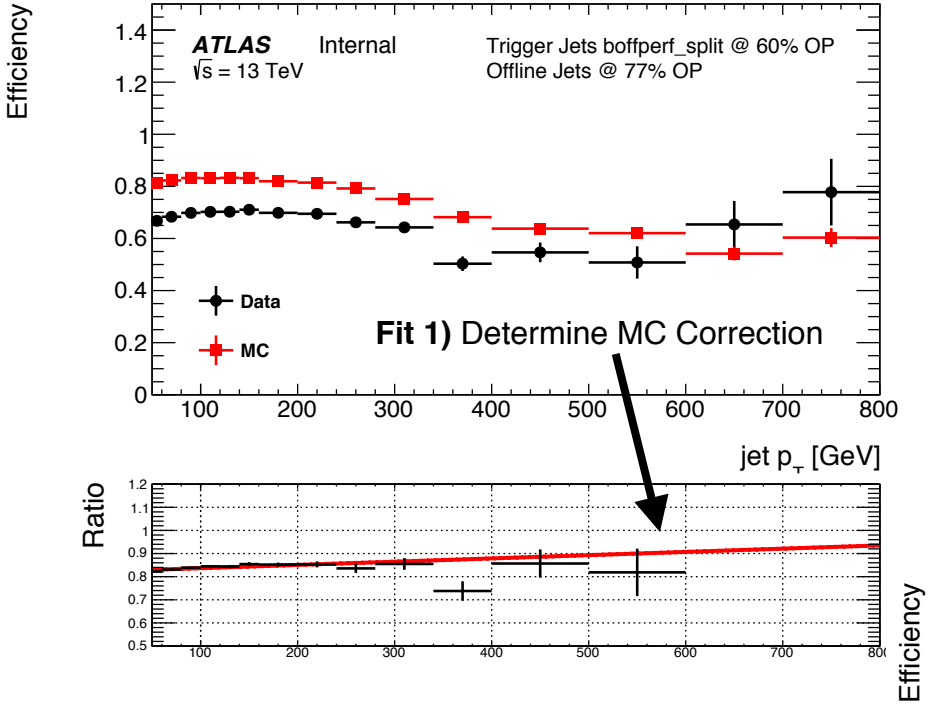
Jet p_T > 120 GeV

1) **Linear fit to Data/MC eff. ratio**
   - Used to correct tail in MC eff.
   - This gives central value
2) **Linear fit to Data/Corrected MC ratio**
   - Errors are taken from this fit
   - Symmetric systematic





2016 data - First look

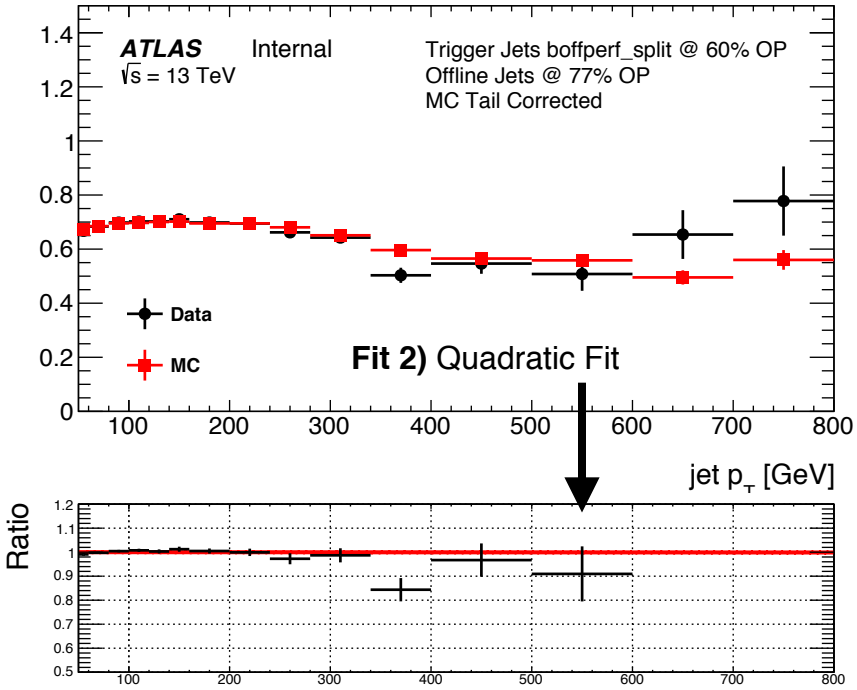


Periods A-F

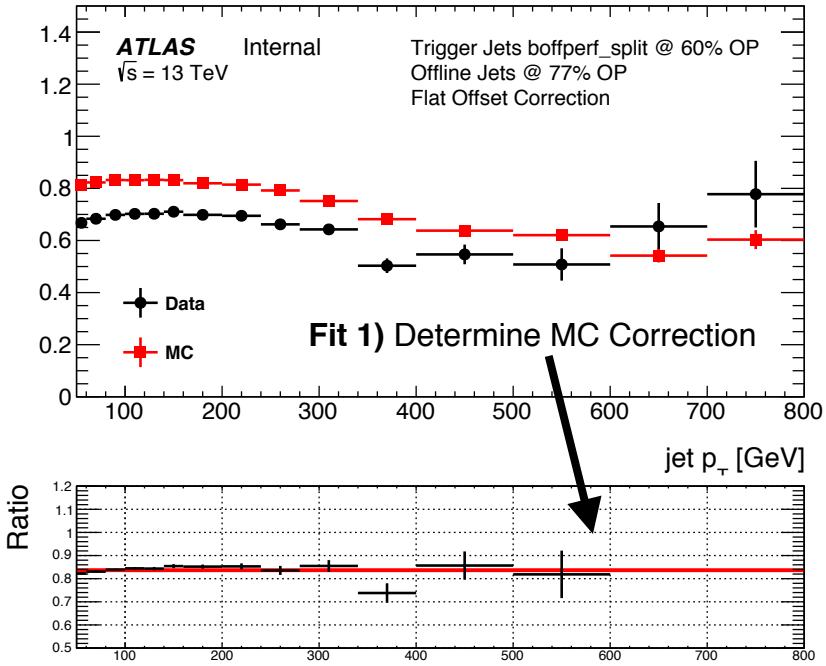
-> Approx 12 fb^{-1}

-> Fit 1 is a linear fit

-> Fit 2 is a quadratic fit



2016 data - First look - Flat offset correction

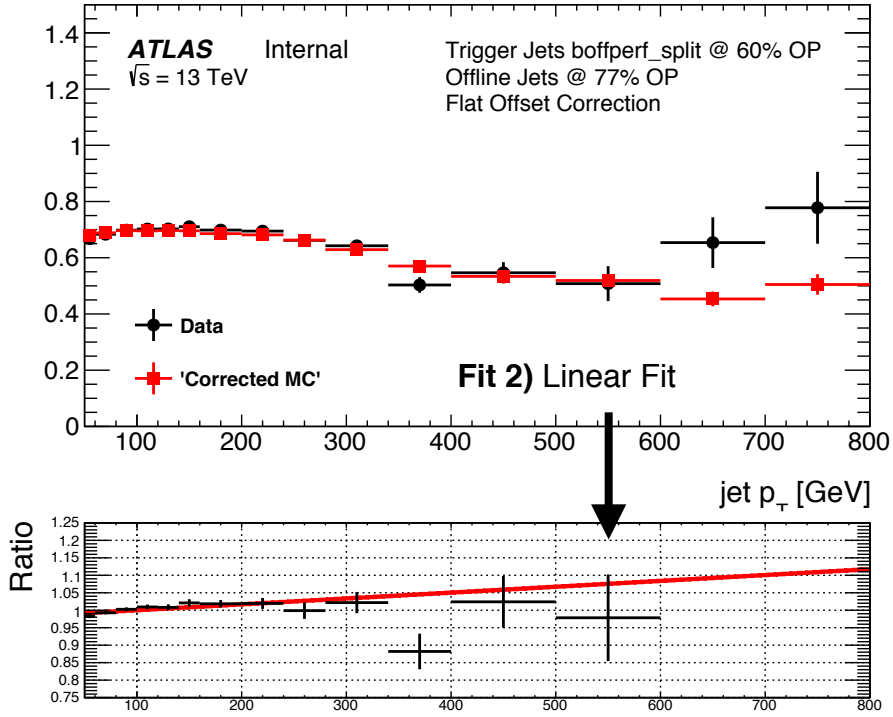


Periods A-F

-> Approx 12 fb^{-1}

-> Fit 1 is an flat line fit

-> Fit 2 is a linear fit



b-Jet Triggers: To Do

- **Work out how best to deal with low stats at high pT**
  => Last time we did a data/MC fit to correct MC
  => We can do something similar with appropriate systematic

- **Ascertain purity of selection**

- **Systematics to deal with MC**

1) Data/MC extrapolation to high pT

2) Non b-jet impurities

=> Difference between effs. for inclusive and truth-matched as b-quads

3) The initial light flavour composition

=> Vary the non-b-jet component of the tt sample by +/- 100%

=> Difference in calculated b-jet trigger efficiency taken as a systematic

4) The light-jet efficiency of the trigger

=> Vary light-jet trigger efficiency from 0 to 1

=> Difference in calculated b-jet trigger efficiency taken as systematic

Backup!