Inclusive b-jet SMP-17-007

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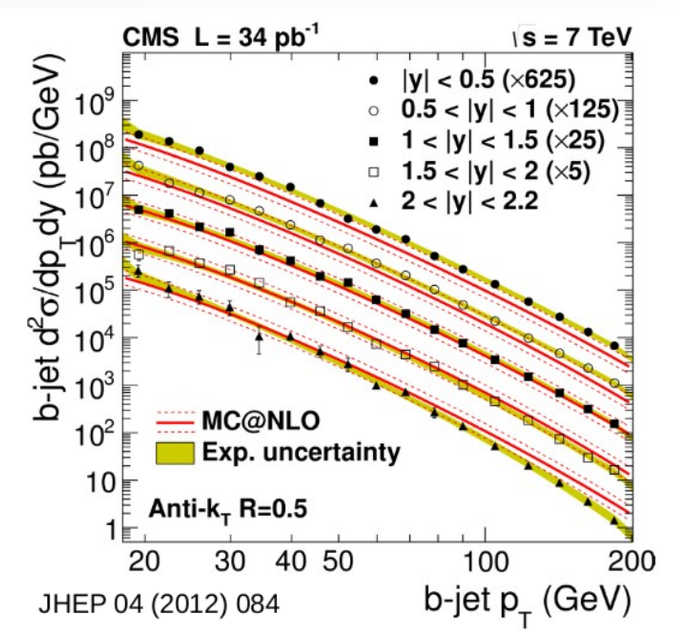
INTRODUCTION

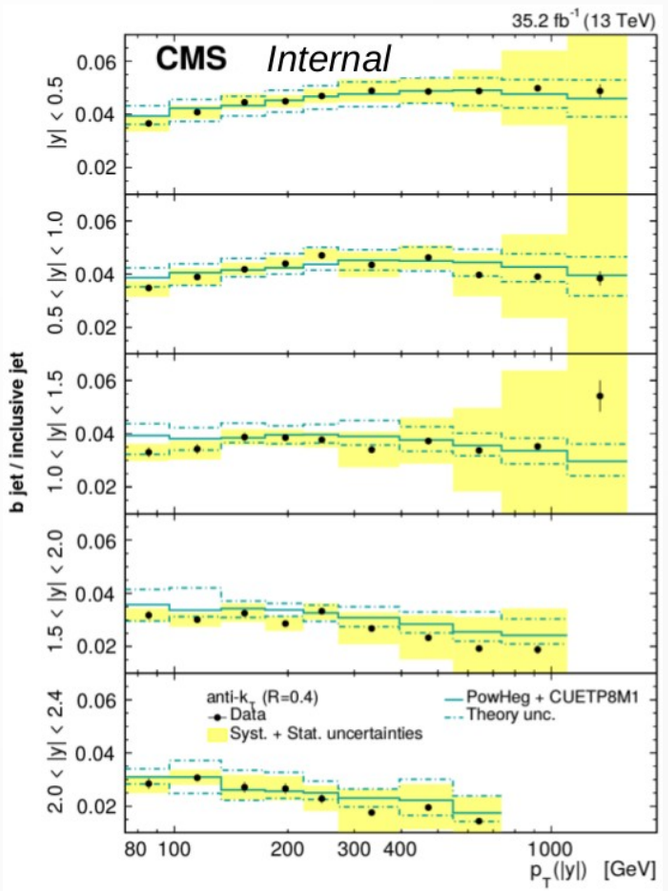
- Reminder
  - Extension of previous CMS measurement at 7TeV using higher luminosity 13 TeV 2016 data



INTRODUCTION

- Status
  - SMP17-007 stuck since pre-approval
  - Notable issues / missing points:
    - Value of discriminant in n-tuples (solved)
    - JEC check flavor effect
    - Method to extract flavor fraction

    Now coupled with inclusive jet analysis

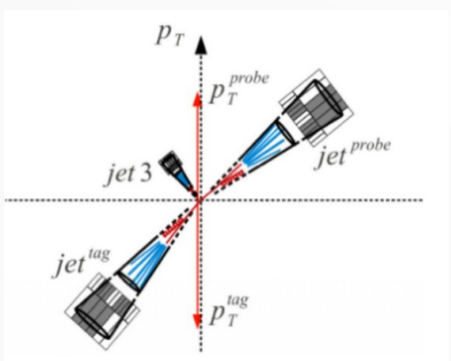


JEC

For calculating the response we used pT balance in di-jet events:

P_T balance response:

$$A = \frac{p_T^{\text{probe}} - p_T^{\text{tag}}}{p_T^{\text{probe}} + p_T^{\text{tag}}}$$



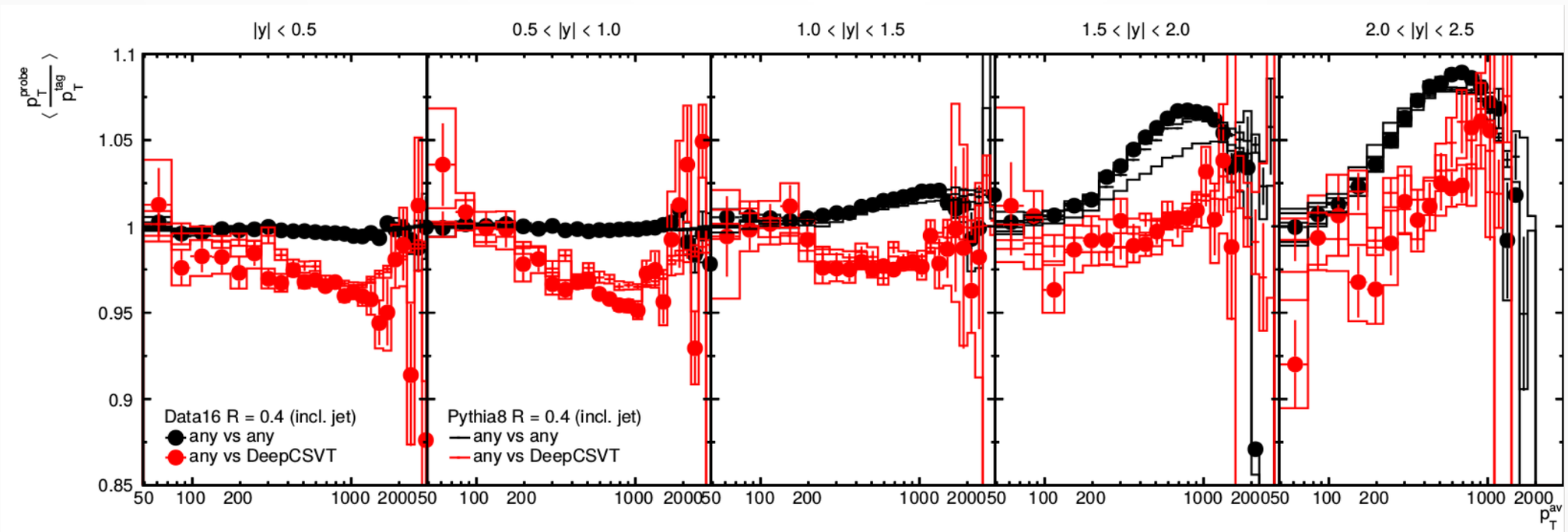
$$|\eta^{\text{tag}}| < 1.3$$

Selection of events:

- tag jet is chosen in barrel region
- selection of tag and probe is random between leading and subleading jet
- 3rd jet pT less than 30% of pT average of leading jets
- leading jets nearly back to back

$$R_{\text{bal}}^{p_T}(\eta, p_T) = \frac{1 + \langle A \rangle}{1 - \langle A \rangle} \longrightarrow R_{\text{bal}}^{p_T} = \left\langle \frac{p_T^{\text{probe}}}{p_T^{\text{tag}}} \right\rangle$$

JEC



- Same response at rec level for Data and MC
- V15 corrections (unreleased) contain corrections based on parton flavor but since there is same response we just will check them

Method

- Reminder
  - BTV provides scale factors (SF) to correct tagging efficiencies and mistag rates, including estimation of syst. unc.
  - In present analysis, each jet is calibrated separately
  - We use several WPs (‘L’ ‘M’ ‘T’)

Method

- Extract b-fraction from inclusive jet signal with template fit of discriminant)
- Using DeepCSV (default) and CSVv2(cross check)
- 2 templates: bc vs udsg
- Bin edges correspond to WPs
- Naive approach: use chi2 fit (with statistical uncertainties only)
- Then add SF variation as systematic unc. for templates

Method

- Apply multi WP calibration fit

$$\chi^2 = \sum \left(\frac{N^{data} - N^{MC}}{\sigma} \right)^2$$

$$\sigma = \sigma^{stat} \oplus \sigma^{syst} \qquad \sigma^{stat} = \sigma^{stat}_{Data}$$

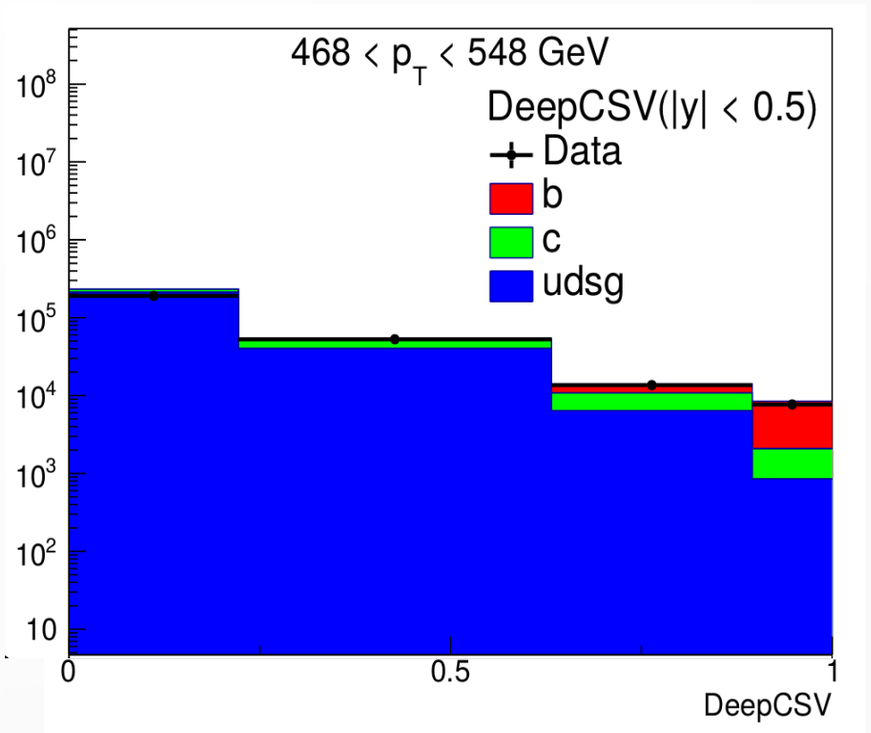
Not taking **correlations** into account

- Templates

$$N^{MC} = N^{bc} + N^{l}$$

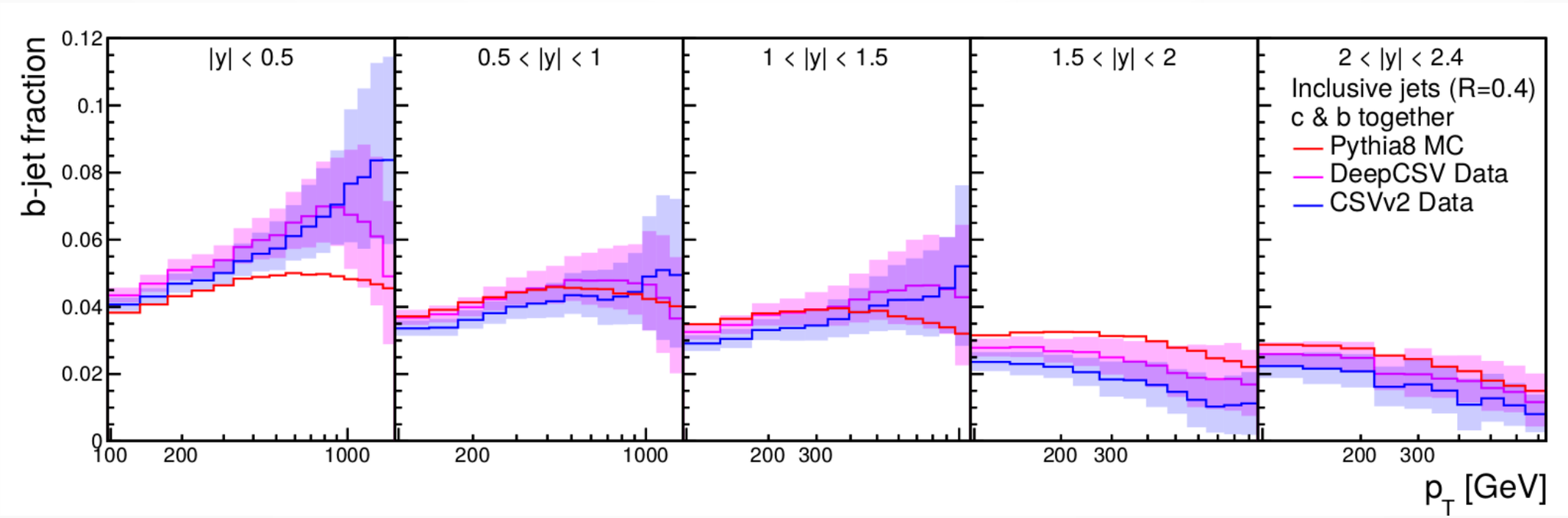
$$\sigma^{syst} = \sigma_{SF_{b,c}} \oplus \sigma_{SF_l}$$

Focus on
c&b vs light template



B-Fraction

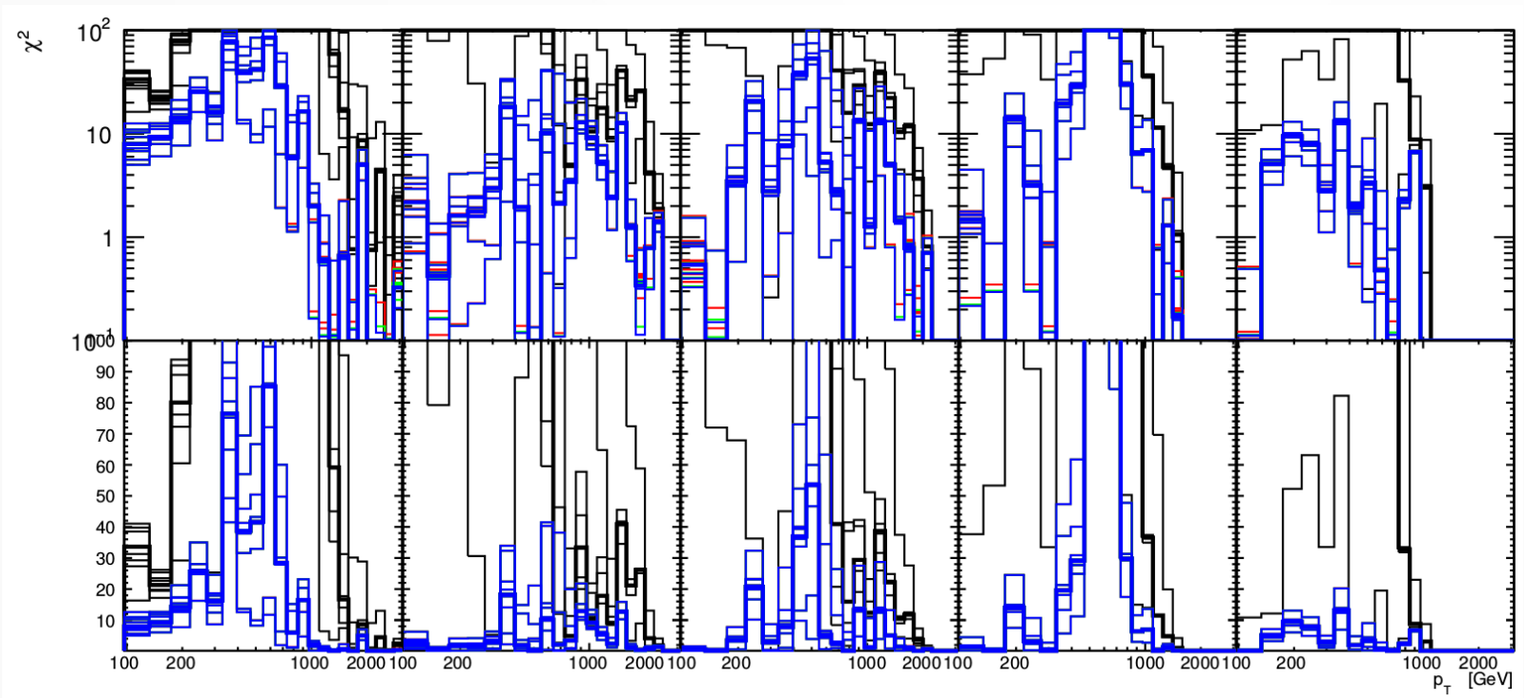
- Naive approach using statistical unc. only



- Good agreement between taggers but not good chi2

B-fraction

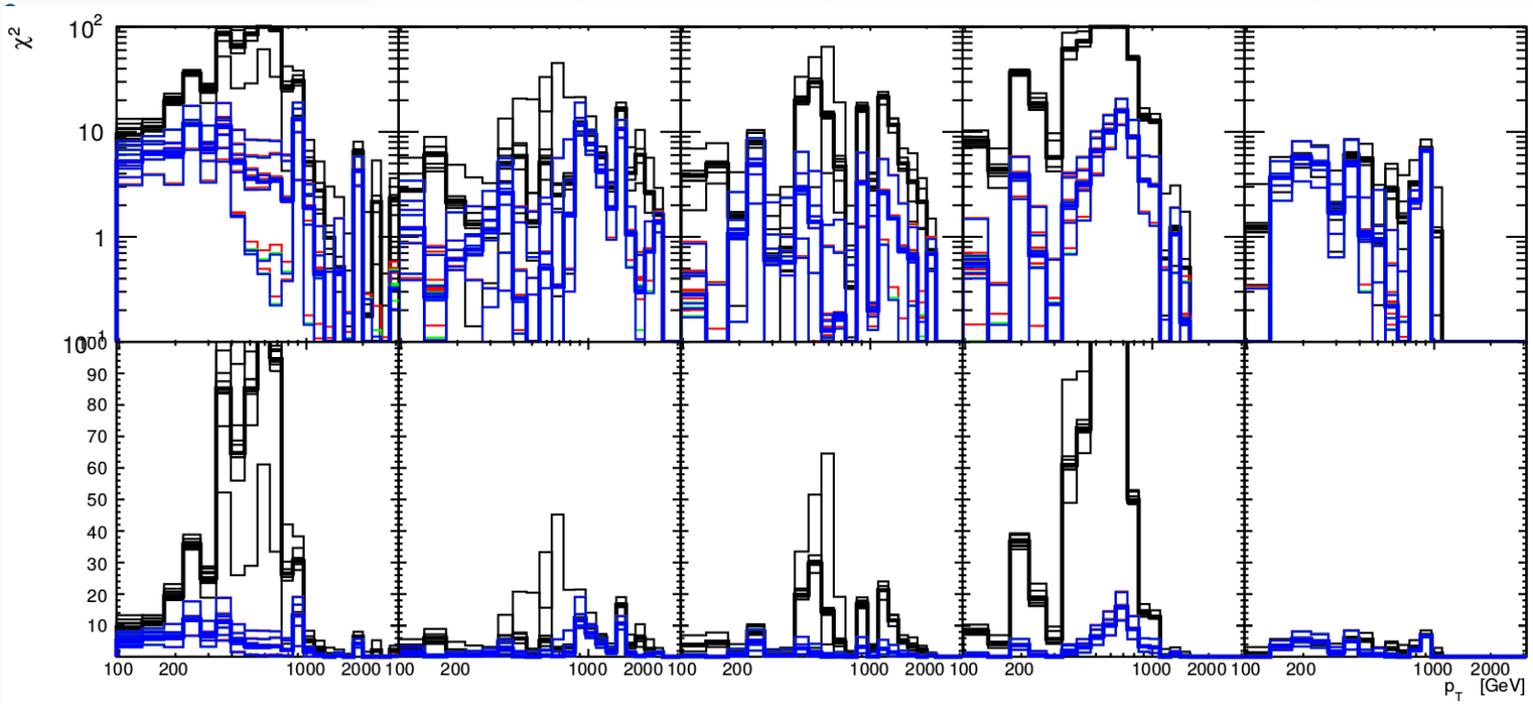
- Scan of chi2 for each pT and y bin



- Blue line (increasing unc. in the first bin) slightly better

B-fraction

- Using also systematics on the fit and also increasing unc. on first bin (non-tagged region)



- Slightly better chi2 but still not good enough need to add a systematic unc on the shape

Conclusions

- Preliminary check on JEC done
- Taking systematics into account increase the fit quality
- Is needed to add another systematic because of the templates have different shape than data

Prospects

- Include correlations in the fit
- Make a global unfolding