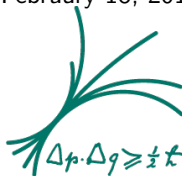


Measurement of the Top Quark Mass in the $t\bar{t} \rightarrow \text{lepton} + \text{jets}$ channel from $\sqrt{s} = 13\text{TeV}$ ATLAS data

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Why Measuring the Top-Quark mass?

How the Data is taken?

How is the Top-Quark mass measured?

Measurement is based on a 3D-Template method:

- Variable 1: m_{top}^{reco} from reconstructed Events
- Variable 2: m_W^{reco} from chosen jet permutation, sensitive to JSF
- Variable 2: R_{bq}^{reco} from chosen jet permutation, sensitive to bJSF

$$R_{bq}^{reco,1b} = \frac{p_T^{btag}}{(p_T^{W_{jet1}} + p_T^{W_{jet2}})/2}$$

$$R_{bq}^{reco,2b} = \frac{p_T^{bhad} + p_T^{blep}}{p_T^{W_{jet1}} + p_T^{W_{jet2}}}$$

Determination of m_{top} :

- Need fully reconstruction of $t\bar{t}$ -finale state
- Template parametrisation of the 3 variables
- Unbinned likelihood fit is performed

Object definition for 2016 data

Electrons

- $E_T > 28 \text{ GeV}$, $|\eta| < 2.47$
- Gradient isolation, TightLH
- HLT_e26_lhtight_nod0_ivarloos,
HLT_e60_lhmedium_nod0,
HLT_e140_lhloose_nod0

Muons

- $E_T > 28 \text{ GeV}$, $|\eta| < 2.47$
- Medium, Gradient isolation
- HLT_mu26_ivarmedium,
HLT_mu50

Small-R jets

- antiKt R = 0.4, EM-Jets
- JVT > 0.59 for $p_T < 60 \text{ GeV}$ and $|\eta| < 2.4$
- b-tagging: MV2_c10, 77% WP

MET/MTW

- $E_T^{\text{miss}} > 20 \text{ GeV}$
- $E_T^{\text{miss}} + m_T^W > 60 \text{ GeV}$

AnalysisTop-02-04-27, with 25 fb-1 for 2016 data

► Top Mass Ntuple production

Pre-selection

- At least one good primary vertex with five associated tracks
- Exactly one isolated high p_T lepton
- At least 4 central jets with high p_T
- 1 or 2 b-tagged jets
- Cuts on E_T^{miss} , m_T^W or $E_T^{miss} + m_T^W$
- W+jets normalization and HF fraction estimated from data
- Multijet background obtained from data in control region

Event yields after preselection

- Background contamination dominated by $W + \text{Jets}$
- Mass dependence of single-top \Rightarrow include in signal
- Reduction of background via cuts on 2 b-tagged jets
- **Good data/MC agreement**

Data/MC agreement

- good Data/MC agreement for jet multiplicities and Missing E_T
- see larger discrepancies for higher b-tag multiplicities
- when we cut on at least two b-tagged jets, the Data/MC agreement gets worse

Data/MC agreement

- Multijet estimate: preliminary estimate from 2015 data from Nedaa scaled to 2016 luminosity
- Therefore see discrepancy at low electron p_T

Data/MC agreement

- Used four jets for KLFitter: priority for b-tagged jets
- Do not use b-tag veto mode, but working point

Data/MC agreement

- Variables used for likelihood fit
- Did not store information to calculate M_W^{reco} , will be shown in the next presentation

$t\bar{t}$ -final state

- 4 jet event \Rightarrow 24 possible jet-parton assignments
- 12 permutations left since light jets from W are indistinguishable
- Kinematic likelihood fit with KLFitter
 - \Rightarrow Chose best permutations for calculation

Reconstruction with KLFitter

- KLFitter input: charged lepton, missing E_T and at least four jets
 \Rightarrow one or two b-tagged jets + untagged jets with highest p_T
- Definition of kinematic Likelihood:
 - Transfer functions (W) for Detector response
 - Breit-Wigner distributions (BW)
 - different options to use b-tagging information

Template parametrisation

- Schau in die Int note!!!!

Workflow for Optimization studies

In the following

Previous results

Summery Conclusion