

# Trigger Studies for Top-Events in ATLAS

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# Outline

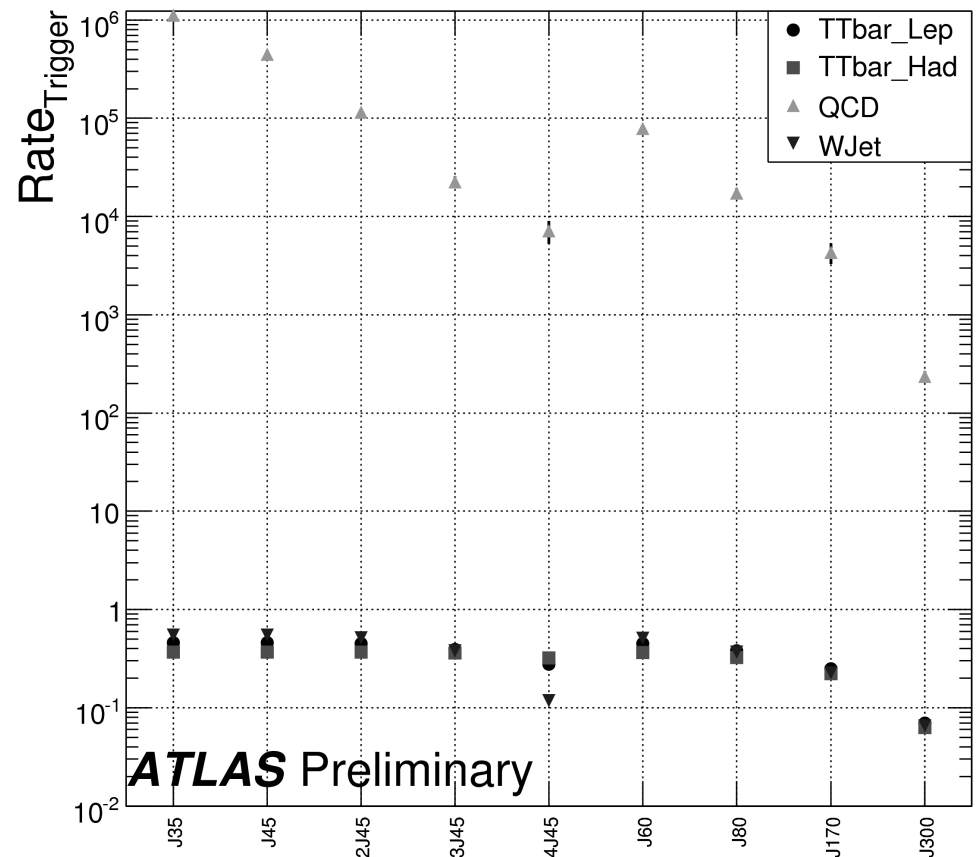
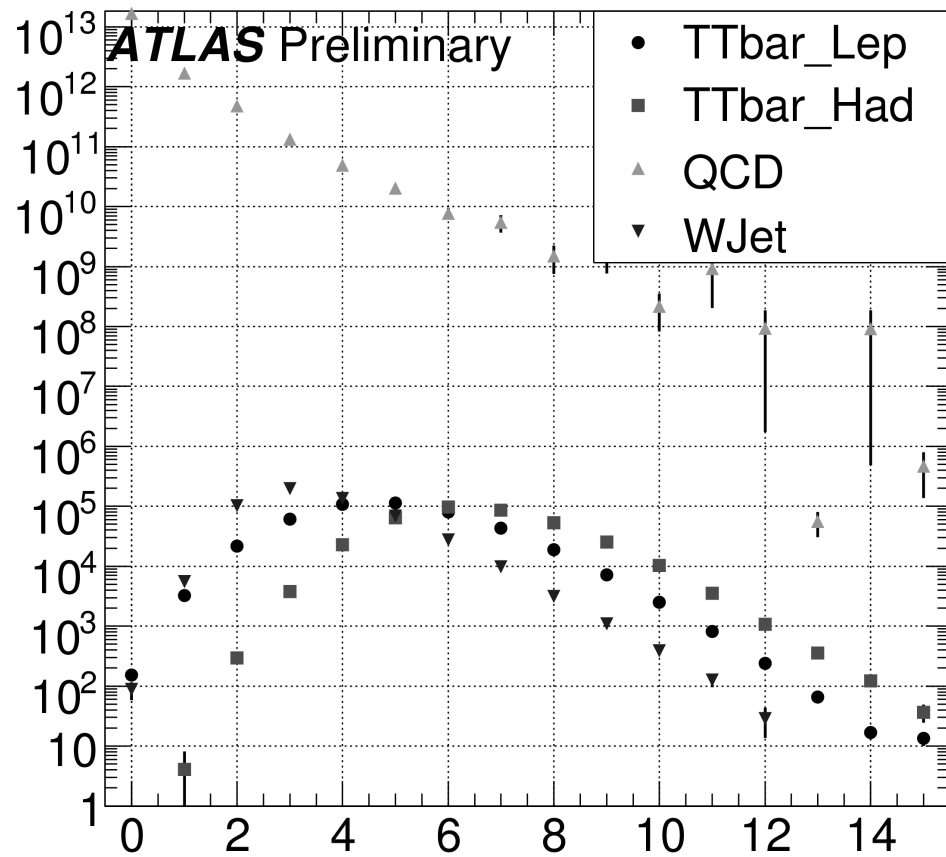
- Status CSC T5 Top Trigger Note
- Jet, Missing Energy and Energy-Sum Trigger
- Trigger Overlap
- Monitoring Trigger
- Full Dress Rehearsal (FDR)
- Outlook

# Status CSC T5 Top Trigger Note

- 2<sup>nd</sup> draft has been sent to the referee(s) – second one has still not answered!?
- short version (for CSC book, approx. 30 pages) contains work from our group in sections on jets, missing energy, energy sum and trigger items overlaps
- long version (ATLAS note, approx. 60 pages) contains more detailed informations e.g. monitor trigger analysis (not in short version due to release 13)
- ...

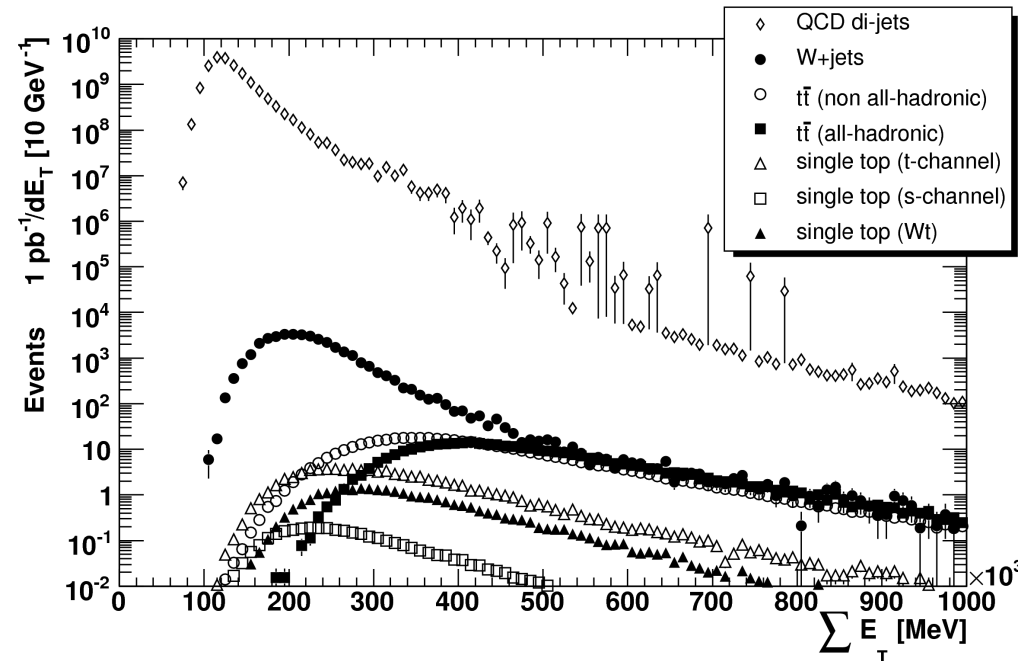
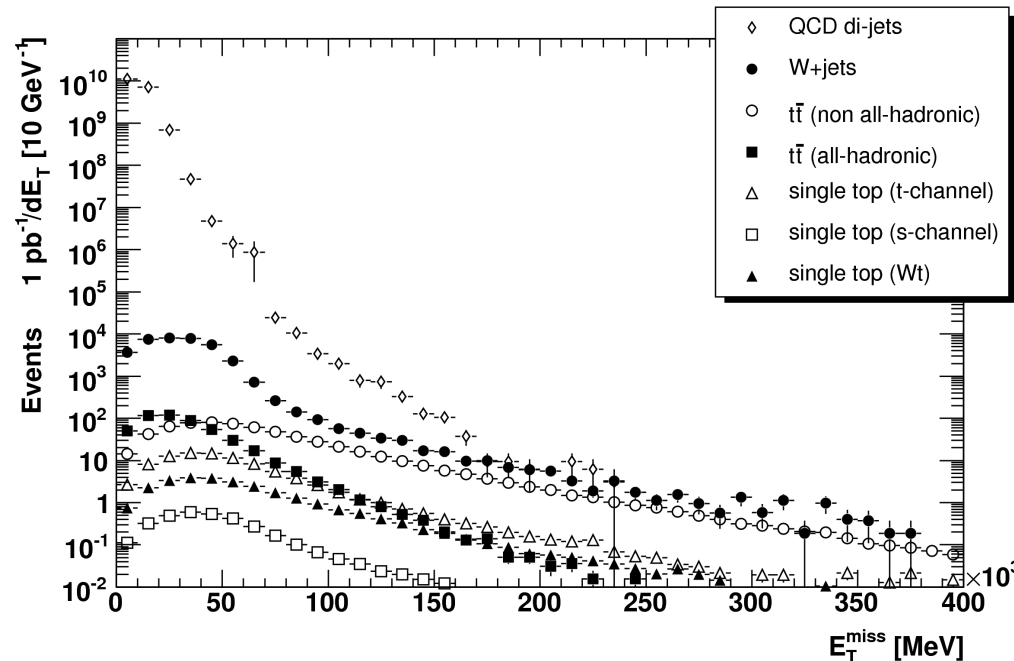
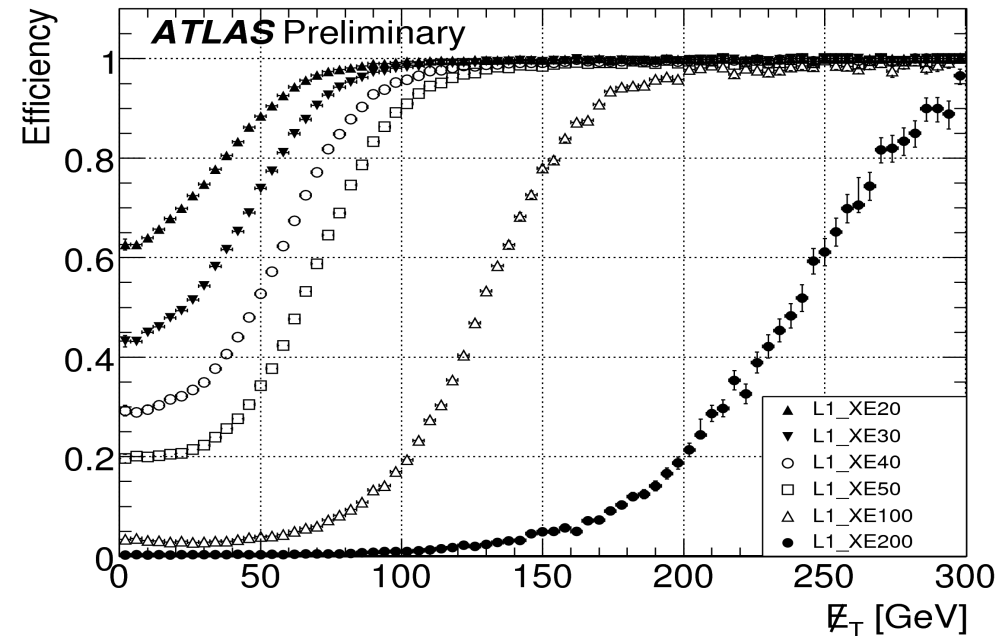
# Jet Trigger for Top Events

- exemplary plots
- number of jets per event
- trigger item rates at  $L=10^{33} \text{ cm}^{-2}\text{s}^{-1}$  for signal and background



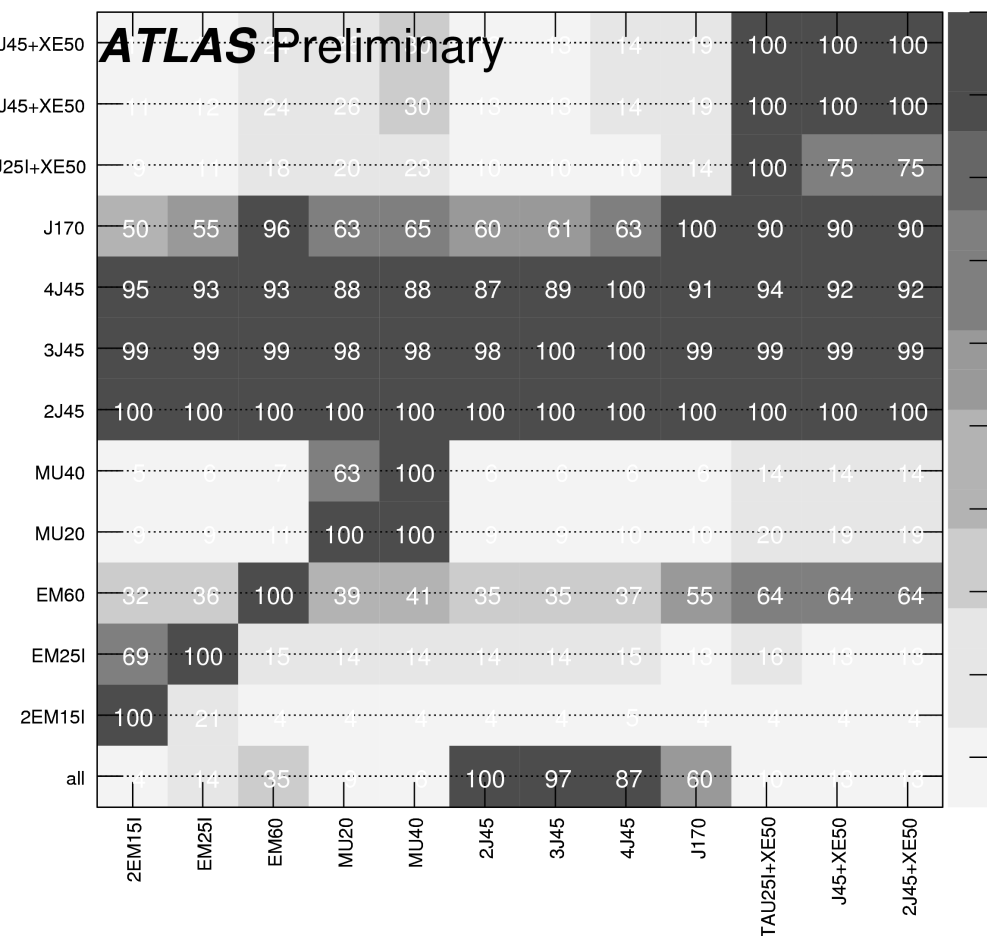
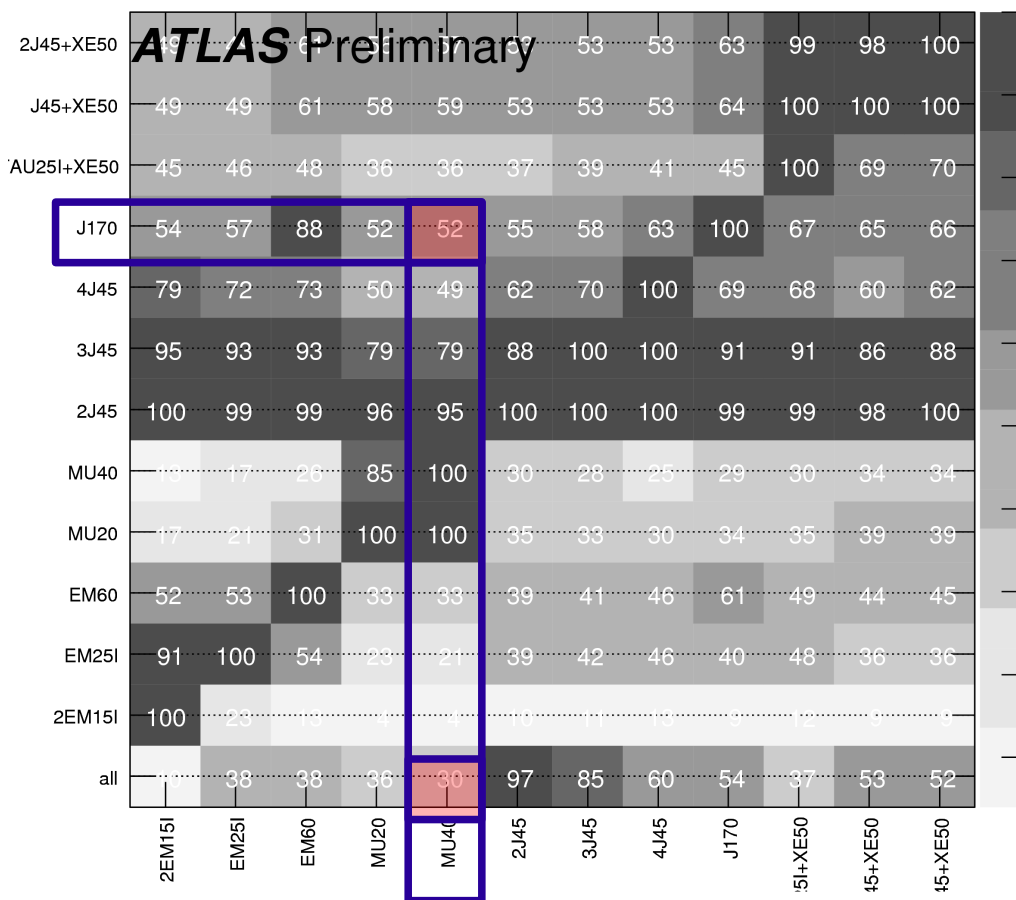
# Missing Energy and Energy-Sum Trigger for Top Events

- exemplary plots
- SumET and MET are intrinsically “low quality” trigger items
- depend strongly on detector systematics, easy to fake
- thresholds of 50 GeV and more needed (still in combination with other items)



# Trigger Item Overlap for Top Events

- exemplary plots
- *correlation* between trigger items
  - » what fraction of event that fired item on x-axis also fired item on y-axis
- e.g. 30% of all events fired MU40, 52% of those also fired J170 trigger

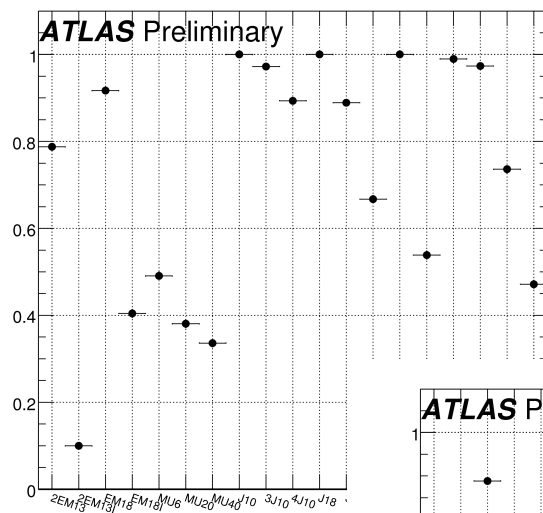


# Monitoring Trigger for Top Events - Overview

- determine trigger efficiencies from data
- only consider events selected by monitoring trigger and get efficiencies of other items relative to the monitoring trigger
- different monitoring trigger investigated
  - J23XE50 – because its large acceptance and constancy across signal and background
  - MU20XE50 – to reduce correlations with especially jet triggers
  - MU20 – to get a correlation free measure for jet triggers
- efficiencies from monitor trigger to be compared with direct measurement (for simulated data only)
  - $\frac{\text{\#events with monitor trigger and item trigger}}{\text{\#events with monitor trigger}}$  versus
  - $\frac{\text{\#events with item trigger}}{\text{all events}}$
- background still not included in analyses

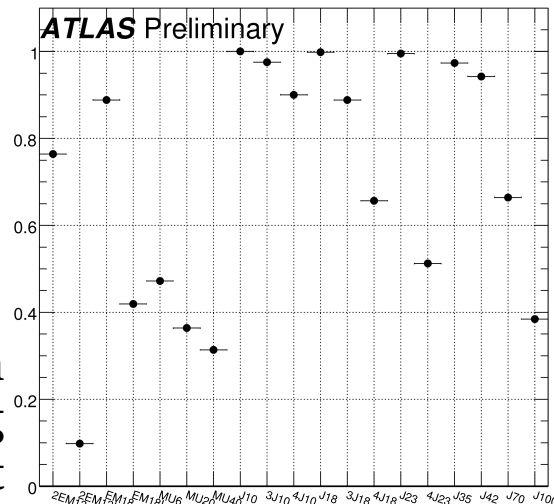
# Monitoring Trigger for Top Events - Preliminary Results

- J23XE50
- LVL1 trigger item efficiencies – direct and monitoring measurement
- ratio of the two (best to be around/at one)

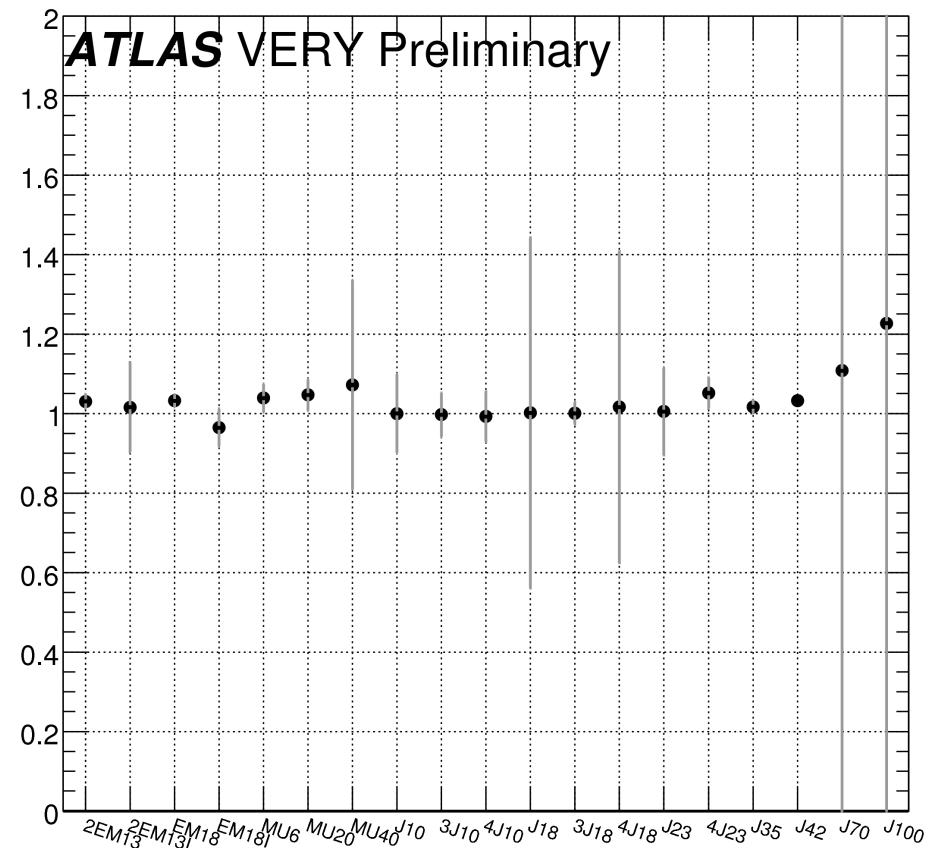


$\epsilon$  of certain item  
measured using  
monitoring trigger

J23XE50 L1Abs Monitor



$\epsilon$  of certain item  
measured using  
direct measurement



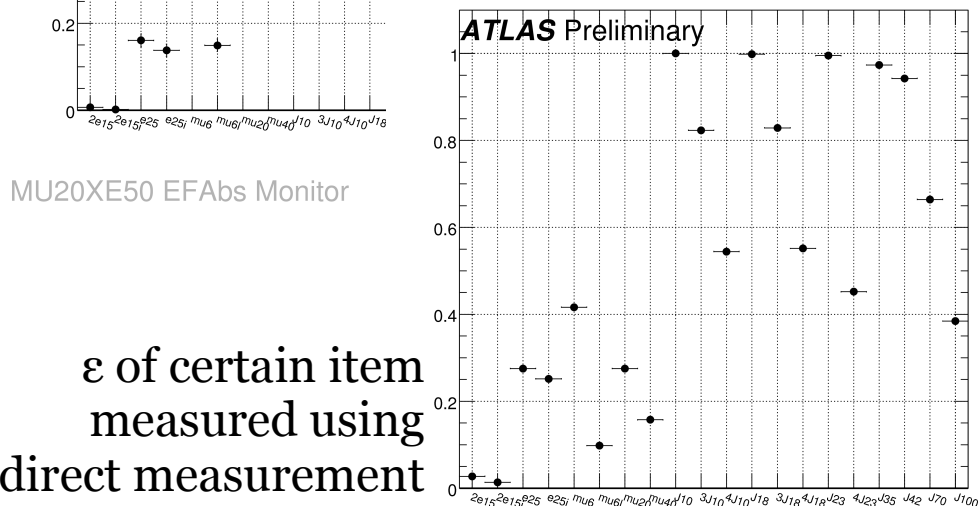
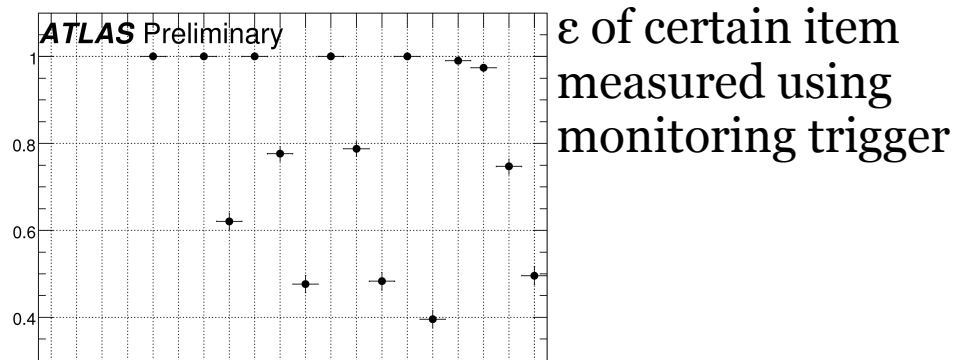
TTbar\_Lep

J23XE50\_L1Abs / 'direct' L1Abs

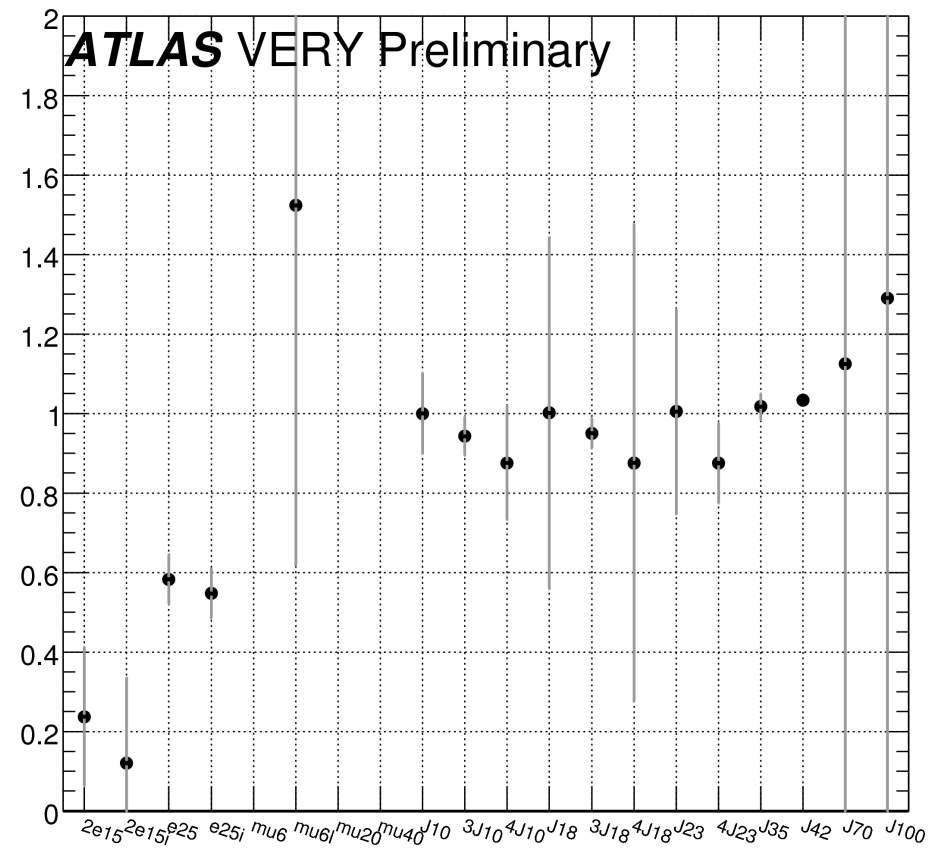


# Monitoring Trigger for Top Events - Preliminary Results

- MU20XE50
- EF trigger item efficiencies – direct and monitoring measurement
- ratio of the two (best to be around/at one)



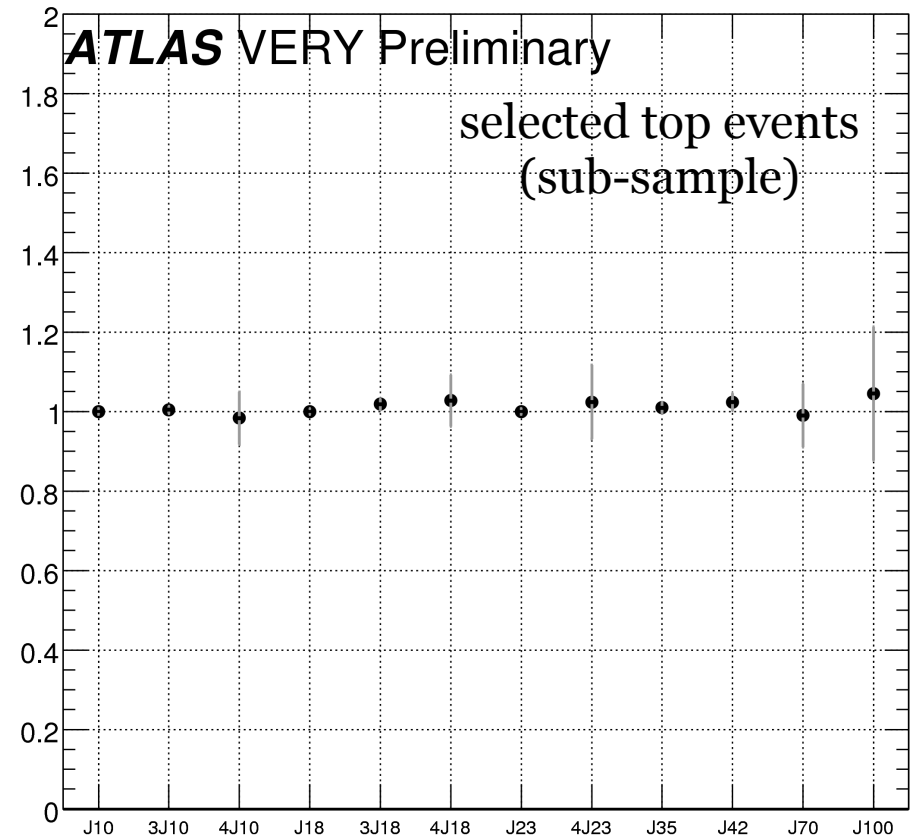
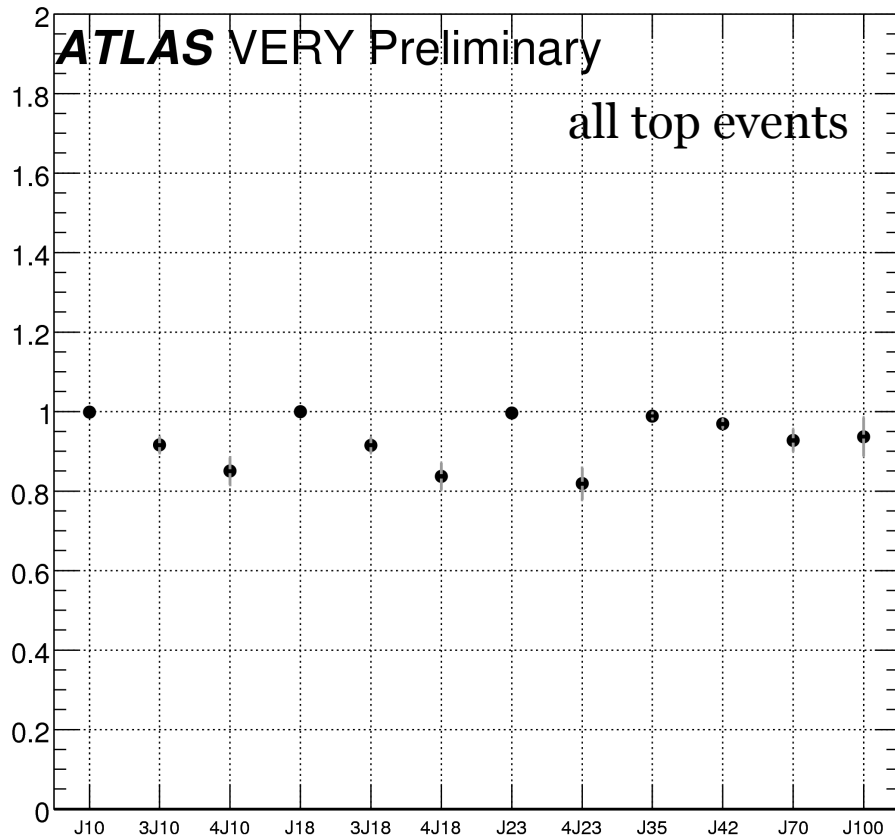
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MU20XE50\_EFabs / 'direct' EFabs

# Monitoring Trigger for Top Events - Preliminary Results

- MU20 – comparison between analysis on complete sample and top-commissioning selection (used for final measurement)
- EF ratio (best to be around/at one)
- improvement especially for higher jet multiplicities, due to event selection » cleaner sample



# Full Dress Rehearsal (FDR) - Overview

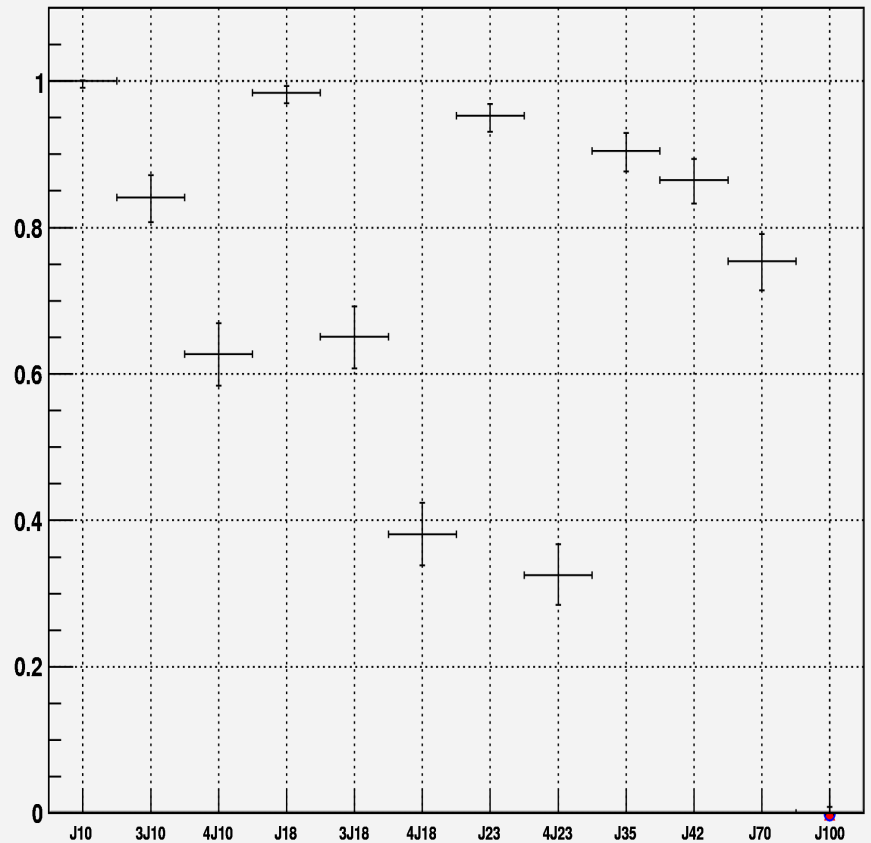
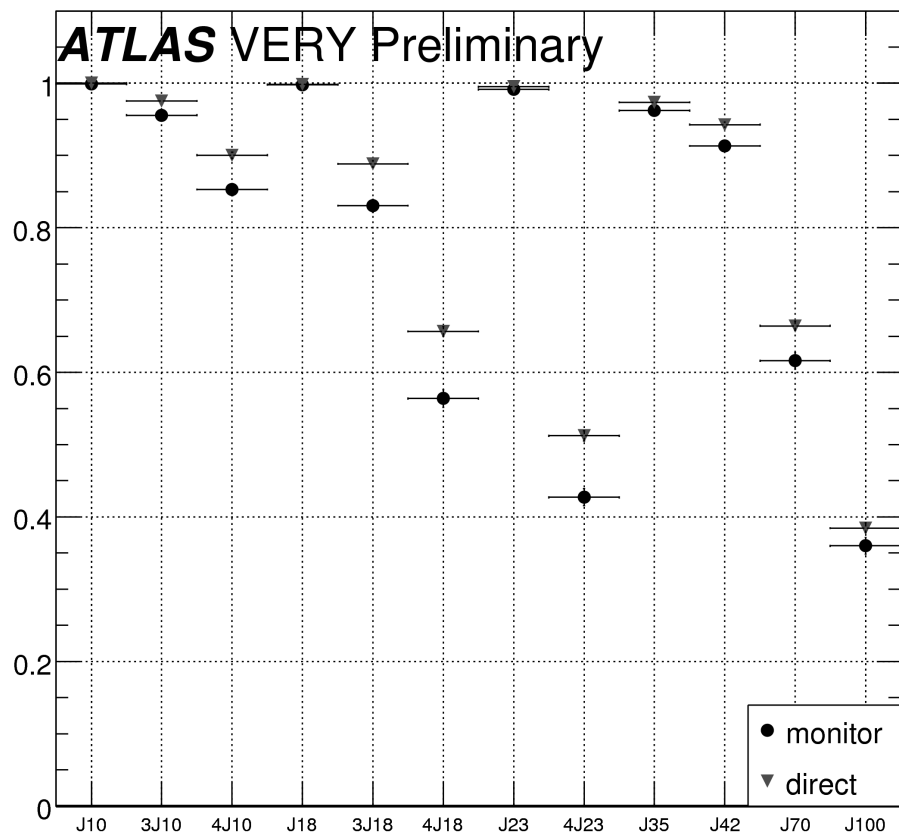
- Goals for FDR (I)
  - Production of common  $D^{1/2/3}PD$
  - Event selection using Tag/Trigger/CondDB
  - Study of physics trigger menus
  - Development of common tools for analysis
  - Exercise physics analysis with early data
- implement monitor trigger analysis into TopView
  - » produce *check* histograms on the fly during e.g. DPD production
- Outcome
  - Due to problems in the mixing process
    - » no *real* backgrounds included
    - » no *real* physics analysis
  - Still some studies possible
  - Main tasks now
    - Development and test of common tools
    - Preparation for FDR-II (May 2008)

# Full Dress Rehearsal (FDR) - Preliminary Results

- got first version running in rel. 13.0.30
- (unfortunately) FDR-I data needs rel. 13.0.40
- haven't got a fully running version of TopView in rel. 13.0.40 yet
  - » obviously very dependent on system and combination of tags
- some very preliminary plots produced with alpha version (in Marcello's running TopView code)
- due to (yet) missing event selection
  - » no discrimination between background and signal
  - » no clean top selection
  - » absolute values not comparable (yet)

# Full Dress Rehearsal (FDR) - Preliminary Results

- relative distribution is about right (not a real result though)
- MU20 monitor trigger



# Outlook

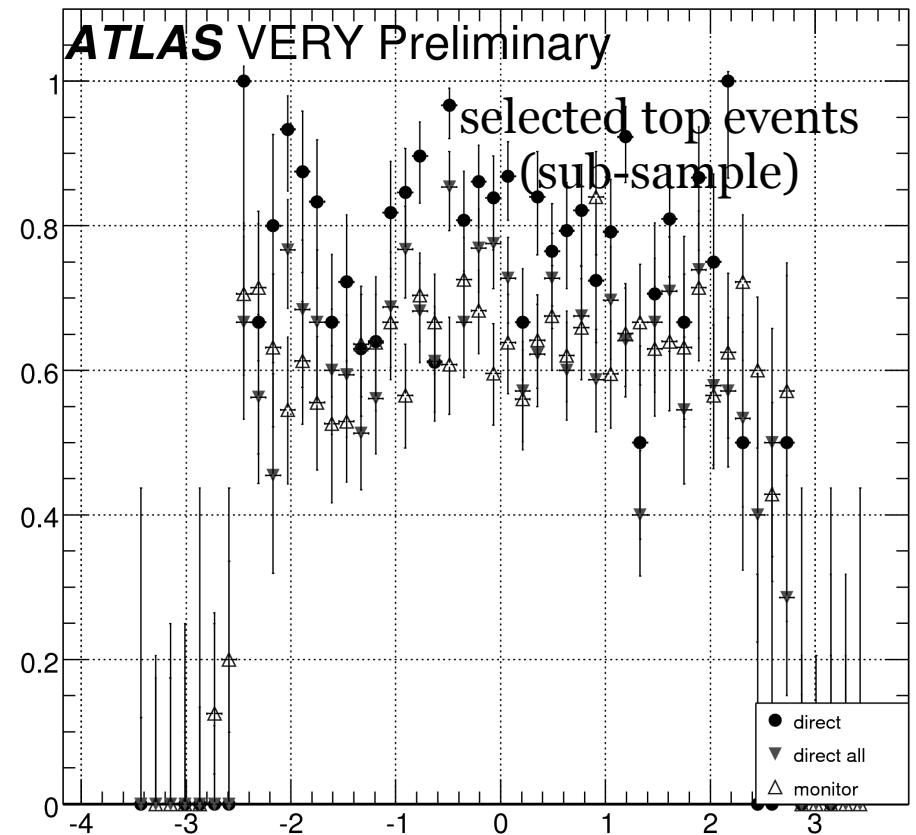
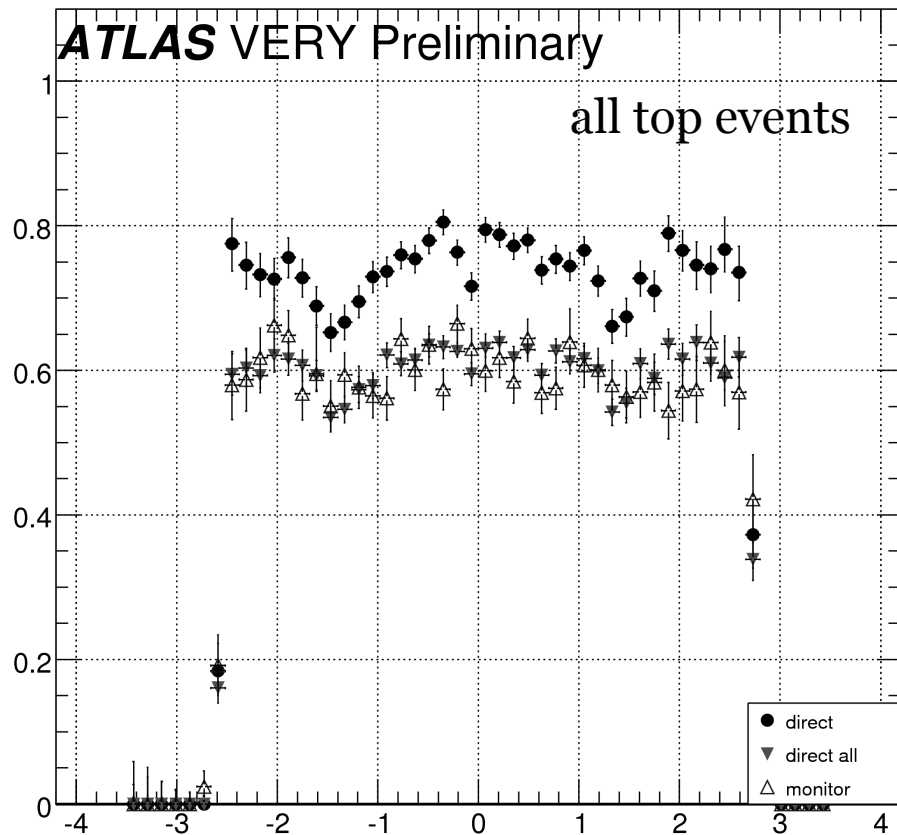
- finish CSC T5 note (short and log version)
- get a *stable* TopView version for FDR analysis
- prepare for FDR-II run/data
- include background in monitor trigger analyses
- use efficiency estimation/measurement as correction in e.g. cross-section measurement
- ...

# Backup Slides

- ...

# Monitoring Trigger for Top Events - Preliminary Results

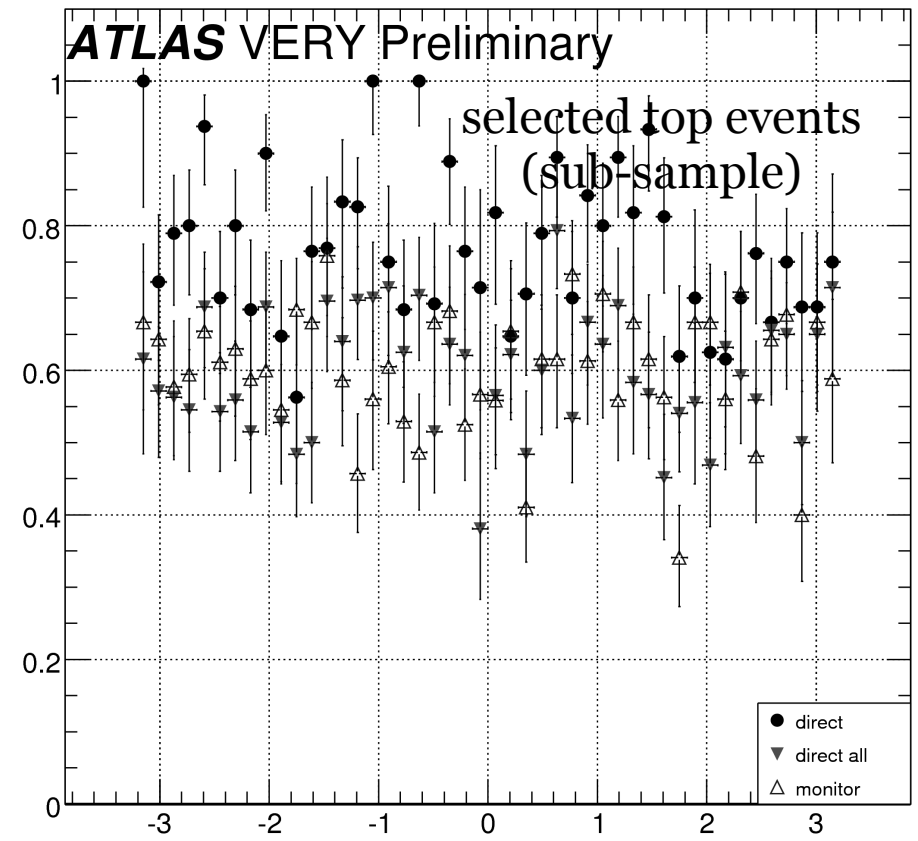
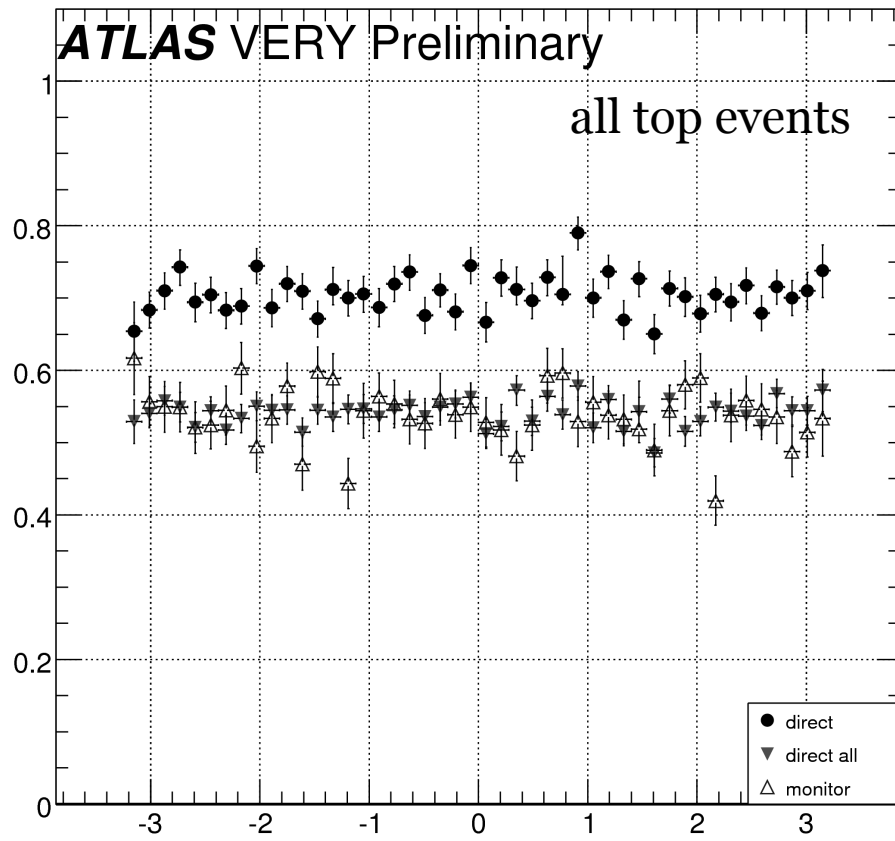
- MU20 – comparison between analysis on complete sample and top-commissioning selection (used for final measurement)
- differential EF efficiency as function of eta





# Monitoring Trigger for Top Events - Preliminary Results

- MU20 – comparison between analysis on complete sample and top-commissioning selection (used for final measurement)
- differential EF efficiency as function of  $\phi$



# Monitoring Trigger for Top Events - Preliminary Results

- MU20 – comparison between analysis on complete sample and top-commissioning selection (used for final measurement)
- differential EF efficiency as function of  $p_T$

