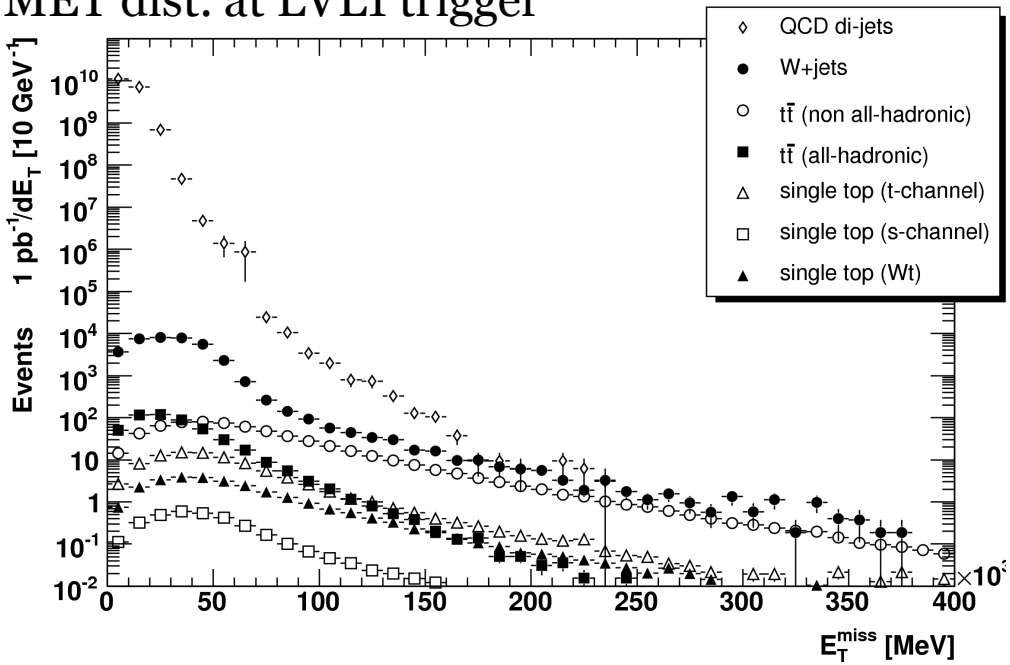
Top-Physics at DESY Zeuthen – An Overview

- Outline
  - E_T-Trigger Studies — Clemens & Marcello
  - Jet-Trigger Studies — SM
  - CSC T5 Note — Clemens, Marcello, SM
  - Monitoring-Trigger Studies — SM
  - Single-Top Selection Cuts — Clemens — see this meeting
  - Data-Production for Top Working Group — Marcello
  - Inclusive Selection Cuts for the Full Dress Rehearsal — Marcello — see last meeting
  - Future Plans

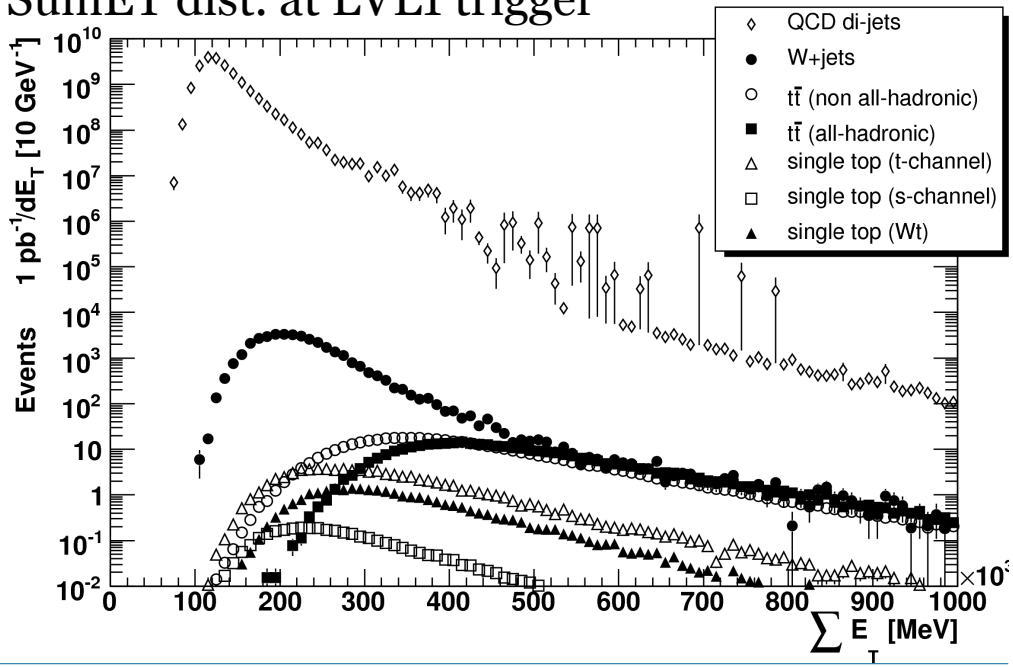
Top-Physics at DESY Zeuthen – An Overview

- E_T-Trigger Studies
  - SumET and MET are intrinsically "low quality" trigger items
  - depend strongly on detector systematics
  - easy to fake
  - despite lack of hard neutrinos in the final state, QCD is major background
  - trigger items must always be used in combination with other items

MET dist. at LVL1 trigger



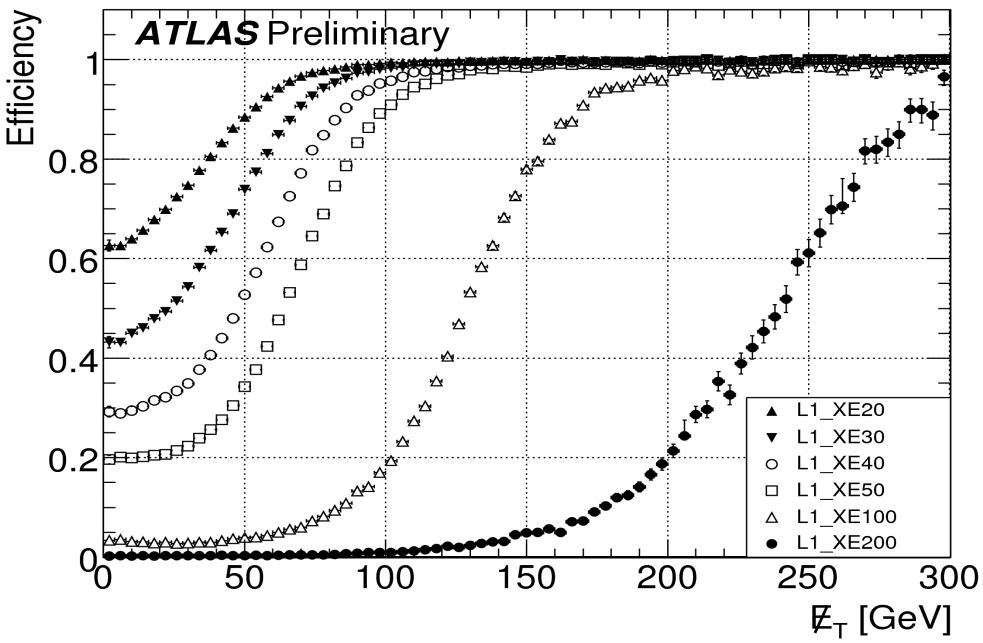
SumET dist. at LVL1 trigger



Top-Physics at DESY Zeuthen – An Overview

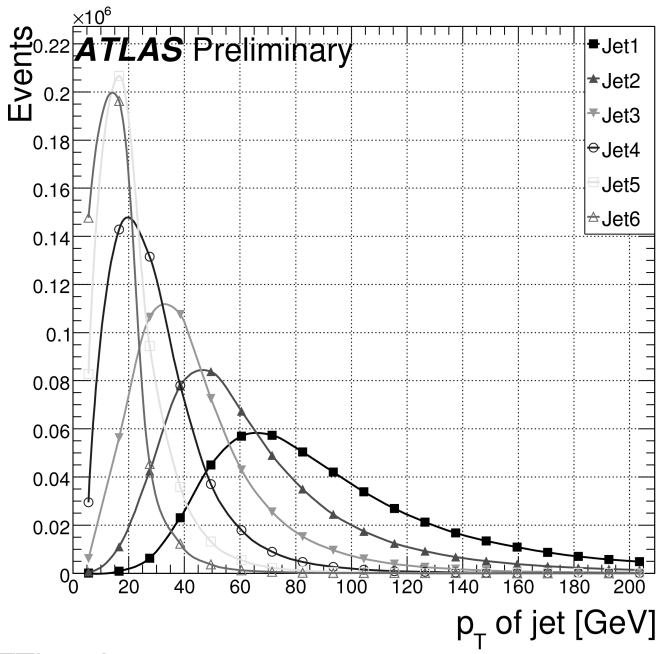
- E_T-Trigger Studies
  - low MET thresholds cannot be used, due to poor resolution and large fluctuations
  - thresholds of 50 GeV and more needed (still in combination with other items)

Turn-On of MET trigger items as LVL1



Top-Physics at DESY Zeuthen – An Overview

- Jet-Trigger Studies
  - several studies have been performed to test, characterise and improve the jet triggers for top events
  - jet seem to be in good shape for top selection/analyses



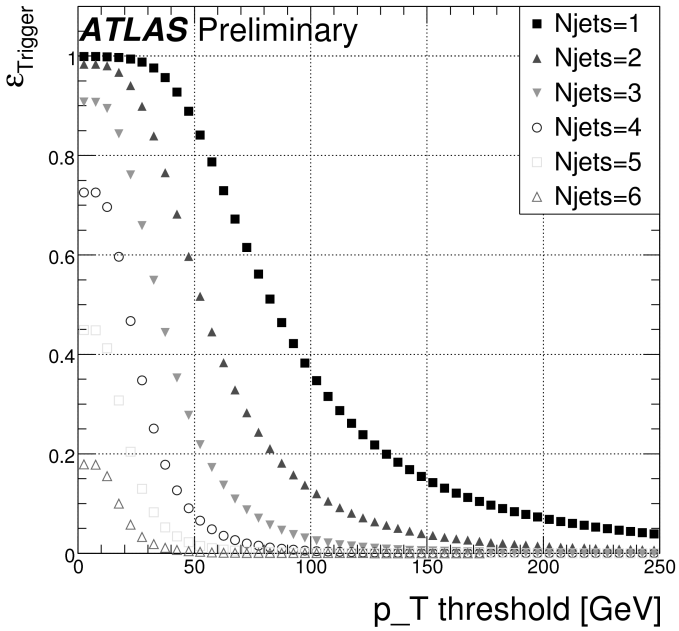
TTbar_Lep

	Sample	J35	J45	2J45	3J45	4J45	J60	J80	J170	J300
LVL1	$t\bar{t}_{lep}$	$4.6{\cdot}10^{-1}$	$4.6{\cdot}10^{-1}$	$4.5{\cdot}10^{-1}$	$3.9{\cdot}10^{-1}$	$2.8{\cdot}10^{-1}$	$4.5{\cdot}10^{-1}$	$3.8{\cdot}10^{-1}$	$2.5{\cdot}10^{-1}$	$7.0{\cdot}10^{-2}$
LVL1	$t\bar{t}_{had}$	$3.7{\cdot}10^{-1}$	$3.7{\cdot}10^{-1}$	$3.7{\cdot}10^{-1}$	$3.6{\cdot}10^{-1}$	$3.2{\cdot}10^{-1}$	$3.7{\cdot}10^{-1}$	$3.3{\cdot}10^{-1}$	$2.2{\cdot}10^{-1}$	$6.3{\cdot}10^{-2}$
LVL1	QCD	$1.1{\cdot}10^{+6}$	$4.5{\cdot}10^{+5}$	$1.1{\cdot}10^{+5}$	$2.2{\cdot}10^{+4}$	$6.6{\cdot}10^{+3}$	$7.8{\cdot}10^{+4}$	$1.6{\cdot}10^{+4}$	$3.6{\cdot}10^{+3}$	$2.4{\cdot}10^{+2}$
LVL1	W+Jet	$5.5{\cdot}10^{-1}$	$5.5{\cdot}10^{-1}$	$5.2{\cdot}10^{-1}$	$3.8{\cdot}10^{-1}$	$1.2{\cdot}10^{-1}$	$5.1{\cdot}10^{-1}$	$3.7{\cdot}10^{-1}$	$2.3{\cdot}10^{-1}$	$6.6{\cdot}10^{-2}$

	Sample	J2(	J160
LVL2	$t\bar{t}_{lep}$	4.6·10	$8.1{\cdot}10^{-2}$
LVL2	$t\bar{t}_{had}$	3.7·10	$7.4{\cdot}10^{-2}$
LVL2	QCD	1.1·10	$2.8{\cdot}10^{+2}$
LVL2	W+Jet	5.5·10	$7.4{\cdot}10^{-2}$
EF	$t\bar{t}_{lep}$	4.6·10	$5.2{\cdot}10^{-2}$
EF	$t\bar{t}_{had}$	3.7·10	$4.8{\cdot}10^{-2}$
EF	QCD	9.4·10	$1.3{\cdot}10^{+2}$
EF	W+Jet	5.5·10	$5.0{\cdot}10^{-2}$

	Sample	J35	J45	2J45	3J45	4J45	J60	J80	J170	J300
LVL1	$t\bar{t}_{lep}$	0.999	0.998	0.971	0.853	0.600	0.972	0.820	0.542	0.151
LVL1	$t\bar{t}_{had}$	1.000	1.000	0.998	0.975	0.872	0.992	0.883	0.601	0.170
LVL1	QCD	0.059	0.024	0.006	0.001	0.000	0.004	0.001	0.000	0.000
LVL1	W+Jet	0.998	0.994	0.939	0.690	0.213	0.923	0.671	0.412	0.120

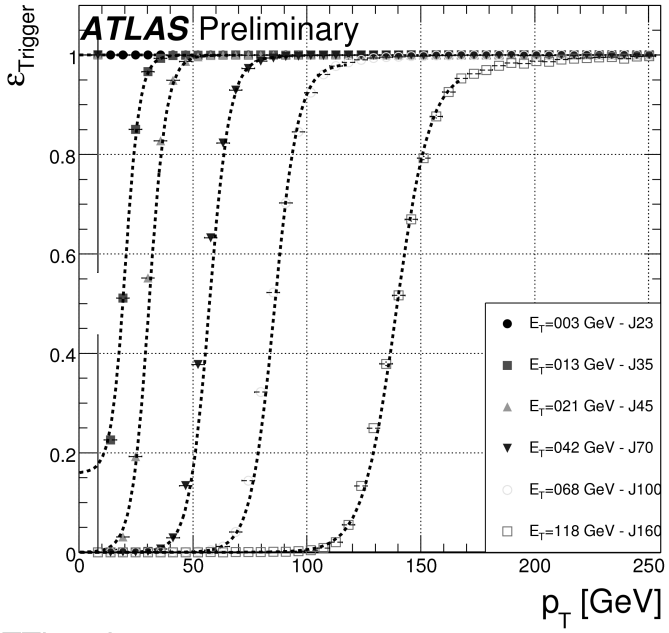
	Sample	J20k	J20a	2J20b	3J20c	4J20d	4J50	3J65	2J120	J160
LVL2	$t\bar{t}_{lep}$	0.999	0.999	0.988	0.923	0.742	0.204	0.262	0.136	0.176
LVL2	$t\bar{t}_{had}$	1.000	1.000	0.999	0.993	0.950	0.395	0.410	0.188	0.200
LVL2	QCD	0.059	0.059	0.014	0.004	0.001	0.000	0.000	0.000	0.000
LVL2	W+Jet	0.998	0.998	0.969	0.807	0.349	0.043	0.108	0.097	0.134
EF	$t\bar{t}_{lep}$	0.999	0.998	0.980	0.895	0.688	0.099	0.143	0.078	0.112
EF	$t\bar{t}_{had}$	1.000	1.000	0.998	0.984	0.920	0.209	0.237	0.112	0.129
EF	QCD	0.050	0.047	0.011	0.002	0.001	0.000	0.000	0.000	0.000
EF	W+Jet	0.993	0.992	0.932	0.707	0.274	0.018	0.052	0.058	0.090



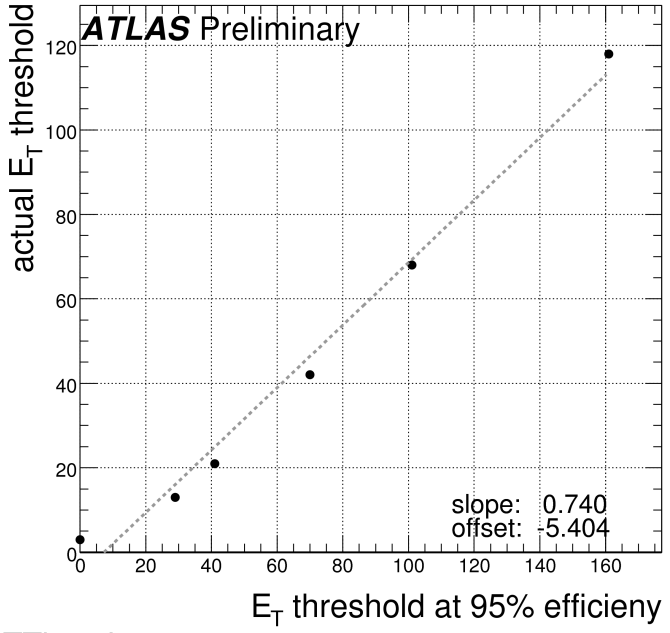
TTbar_Lep

Top-Physics at DESY Zeuthen – An Overview

- Jet-Trigger Studies



TTbar_Lep



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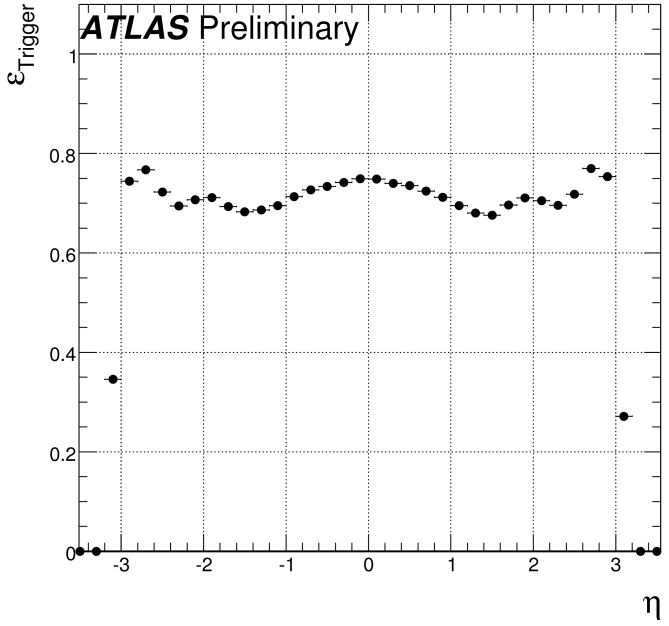
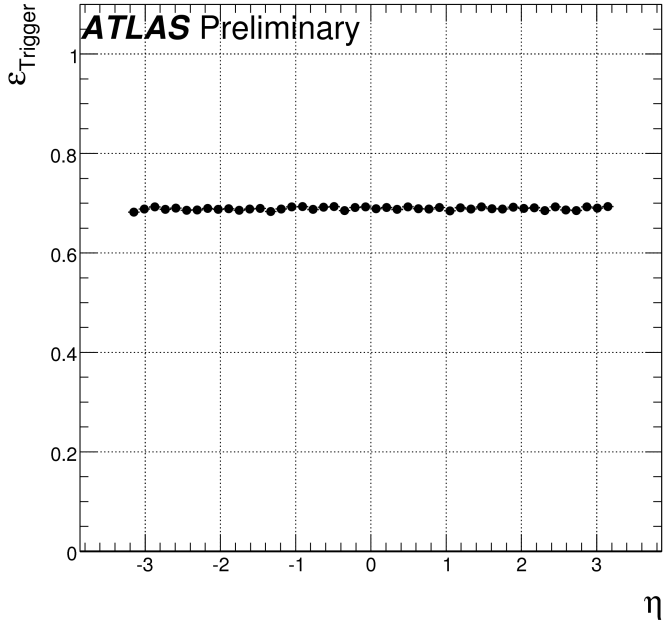


TTbar_Lep



TTbar_Lep

Top-Physics at DESY Zeuthen – An Overview

- CSC T5 Note
  - deadline for first referee draft has been December 21st
  - we contributed to 5 out of approx. 13 sections (topics discussed before)
  - now in peer review

Top-Physics at DESY Zeuthen – An Overview

- Monitoring-Trigger Studies
  - 'efficiency' a matter of definition (using MC)
    - 'absolute' efficiency: mostly for rate determination

$$\frac{\text{events selected by trigger}}{\text{total event number}}$$

e.g. in which fraction of events was L1_J23 fired

Abs

    - 'effective' efficiency: for checking the 'quality' of a trigger item

$$\frac{\text{events containing right number of object-type in question and selected by trigger}}{\text{events containing right number of object-type in question}}$$

e.g. out of the events that had 2 jets, how many passed the L1_2J23 trigger

Count noKin

$$\frac{\text{events containing the object in question and selected by trigger}}{\text{events containing the object in question}}$$

e.g. out of the events that had 2 jets with more than 23 GeV each, how many passed the L1_2J23 trigger

Count

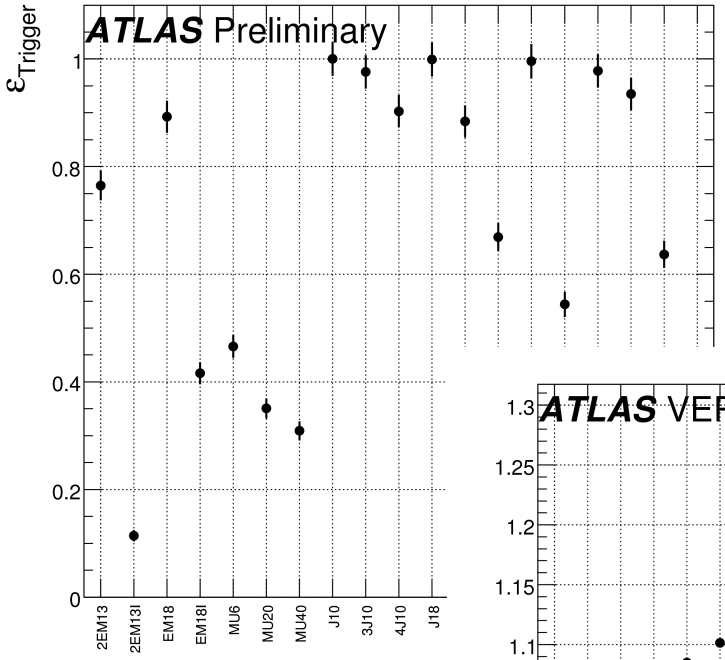
- the 'effective' efficiency should always be higher than the 'absolute' efficiency
- within the 'effective' efficiencies the latter one should be the higher one

Top-Physics at DESY Zeuthen – An Overview

- Monitoring-Trigger Studies
  - in real life (real data) only events selected by any trigger will be stored
    -> need a relative measurement of the efficiency
    -> Monitoring Trigger (J23XE50 – one jet with at least 23 GeV and 50 GeV missing Energy)
  - only consider events selected by J23XE50 and
    get efficiencies of other items 'relative' to J23XE50
  - J23XE50 'cause it's large acceptance and constancy across signal and background
  - so far study has only been done on 1000 events (TopView ntuple based on 13.0.30)
  - more statistics on the way
    -> will allow for systematic error evaluation
    -> will of course increase accuracy (might solve some of the 'problems')

Top-Physics at DESY Zeuthen – An Overview

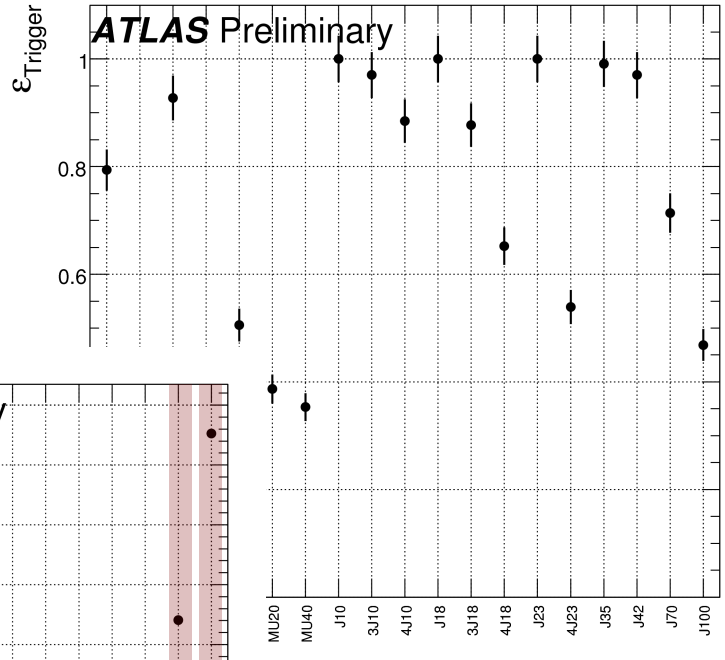
- Monitoring-Trigger Studies
  - 'absolute' efficiency at Level 1:



TTbar_Lep

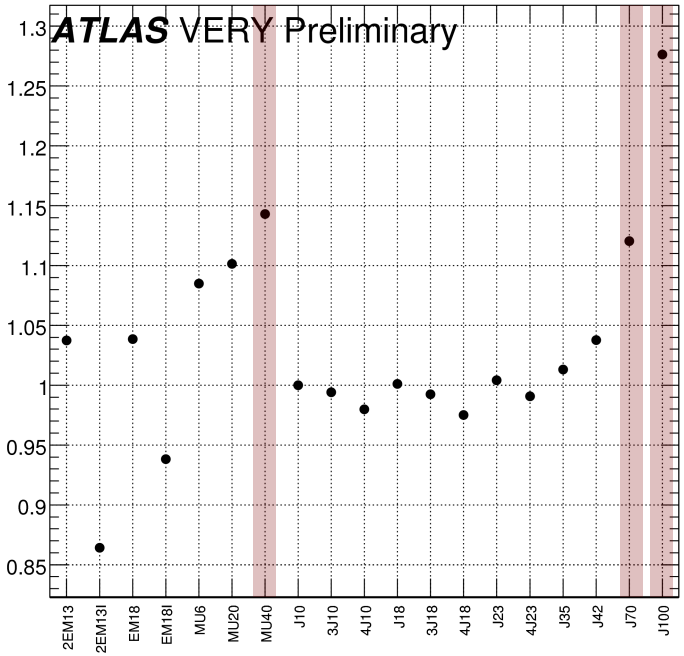
Abs

Ratio



Monitor

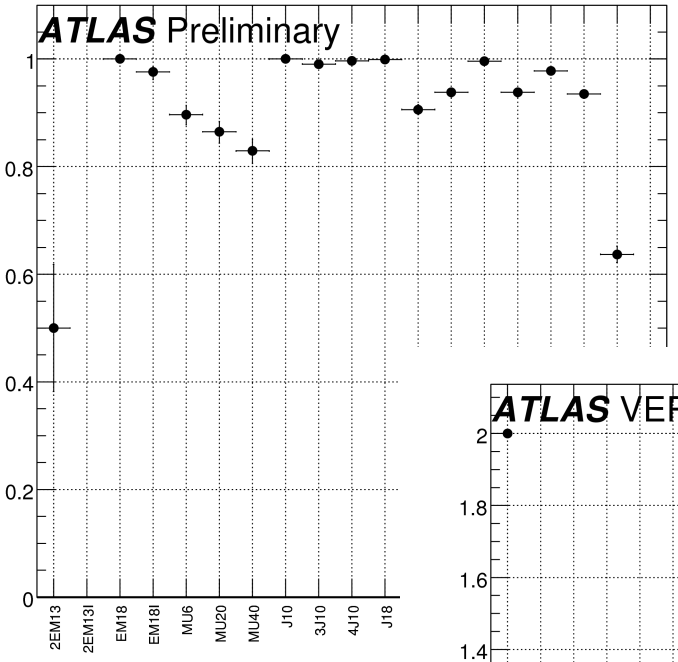
Monitor Abs



'direct' L1Abs / J23XE50_L1Abs

Top-Physics at DESY Zeuthen – An Overview

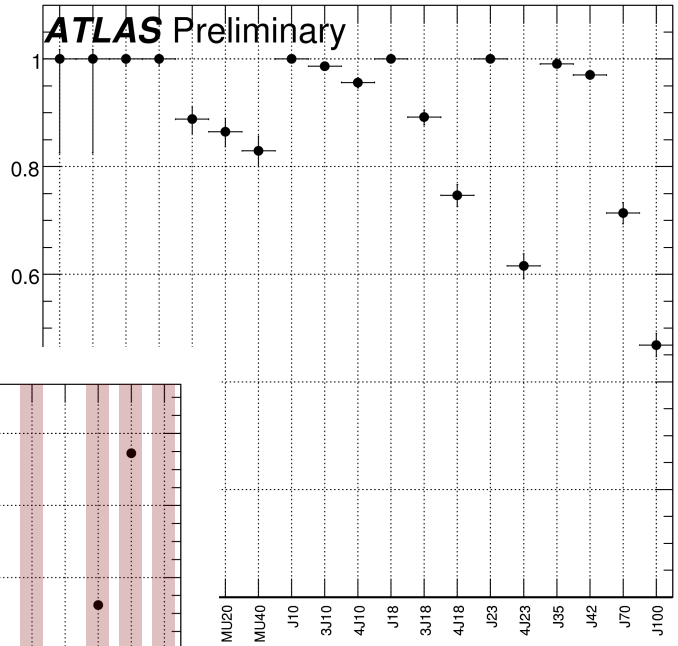
- Monitoring-Trigger Studies
  - 'effective' efficiency at Level 1:



'direct' L1noKin to compare v

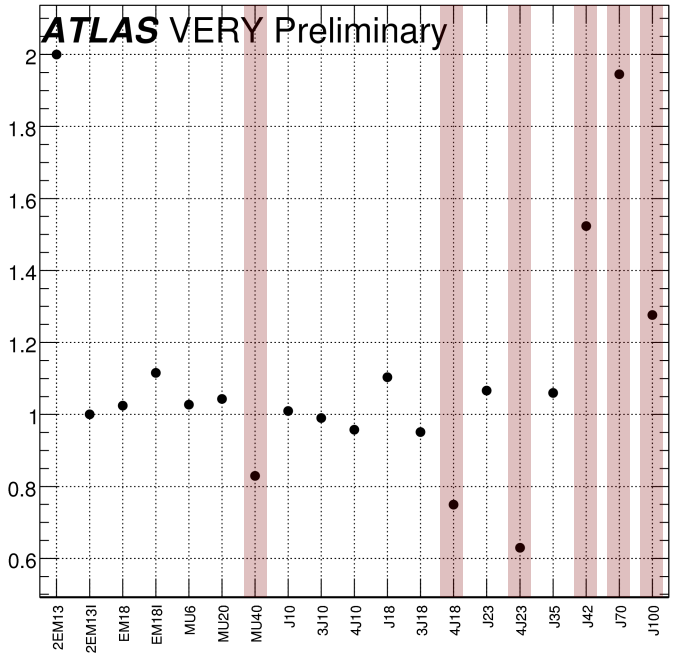
Count noKin

Ratio



n Monitor

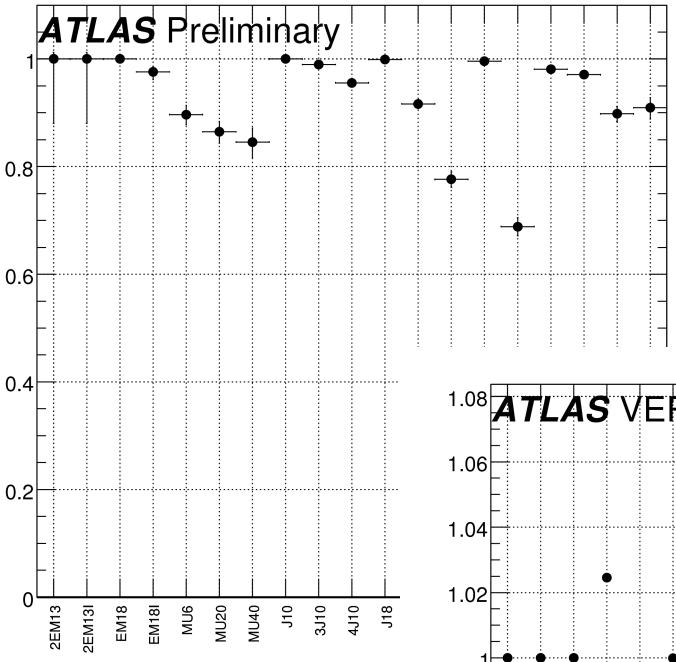
Monitor count noKin



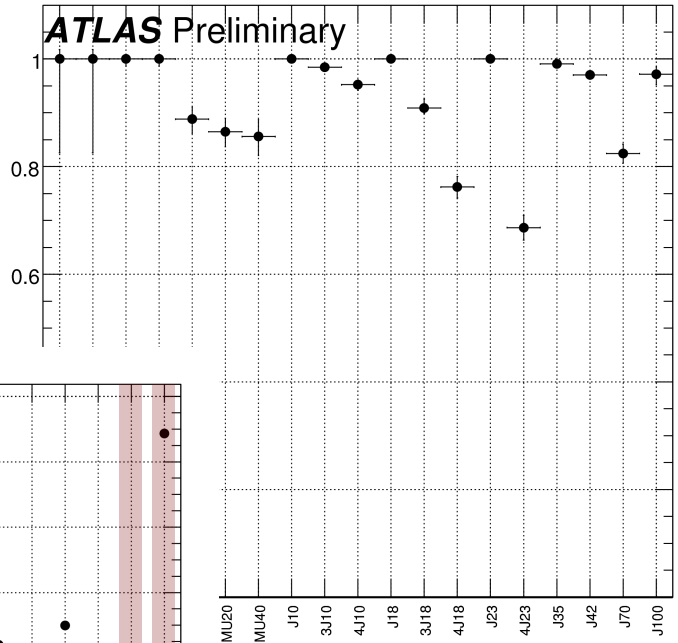
'direct' count L1noKin / J23XE50_L1noKin

Top-Physics at DESY Zeuthen – An Overview

- Monitoring-Trigger Studies
  - 'effective' efficiency at Level 1:



Ratio

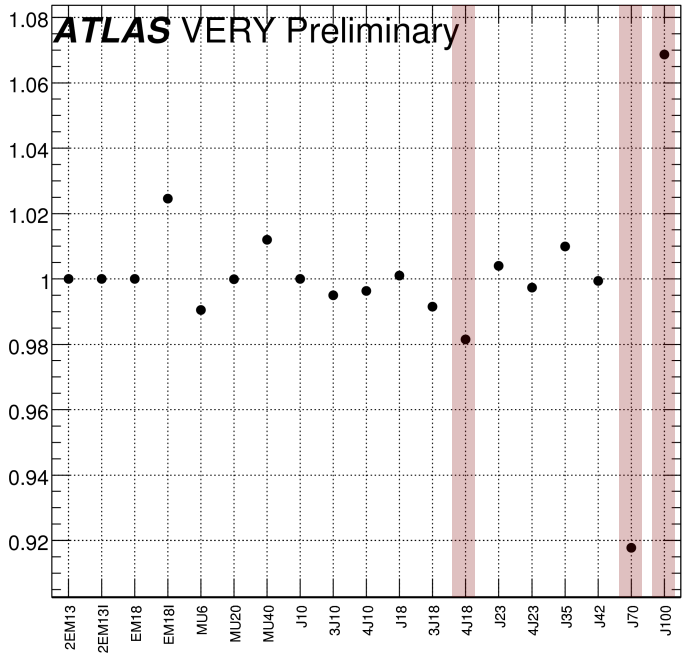


'direct' L1 to compare with J2

itor

Count

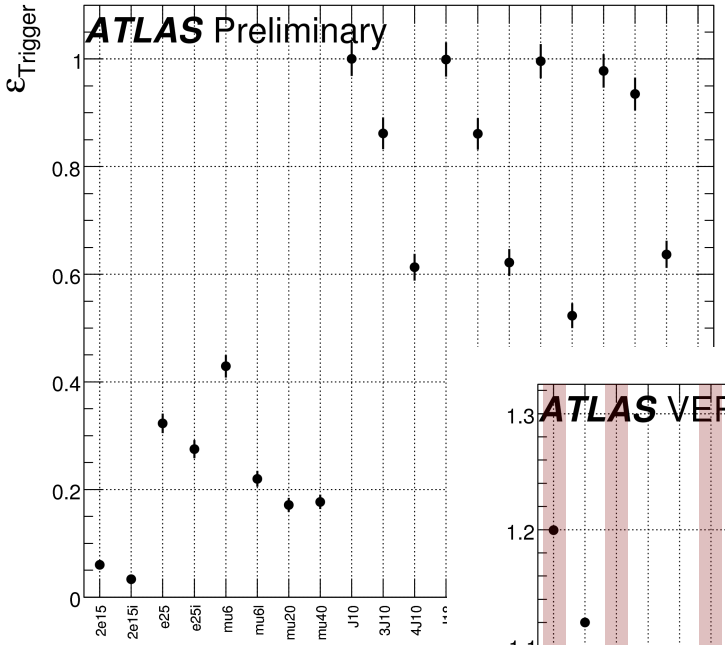
Monitor count



'direct' count L1 / J23XE50_L1

Top-Physics at DESY Zeuthen – An Overview

- Monitoring-Trigger Studies
  - 'absolute' efficiency at Level 2:



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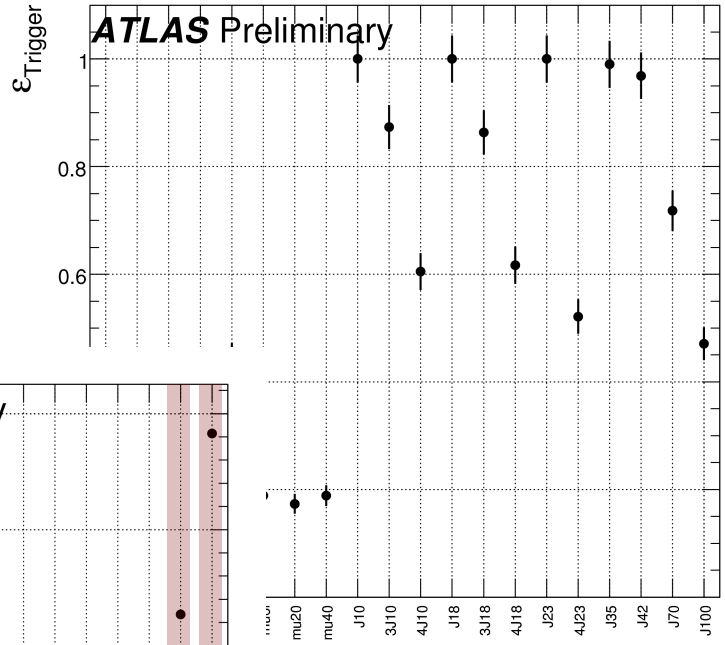
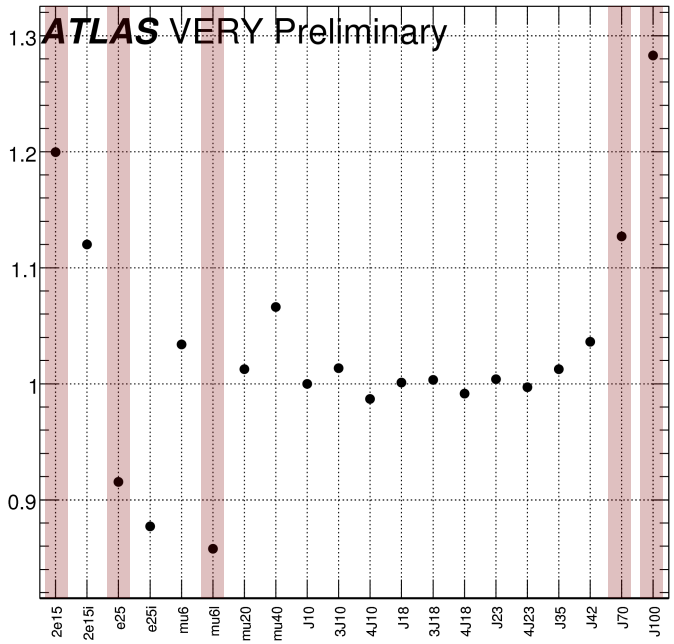
Abs

Ratio



Monitor

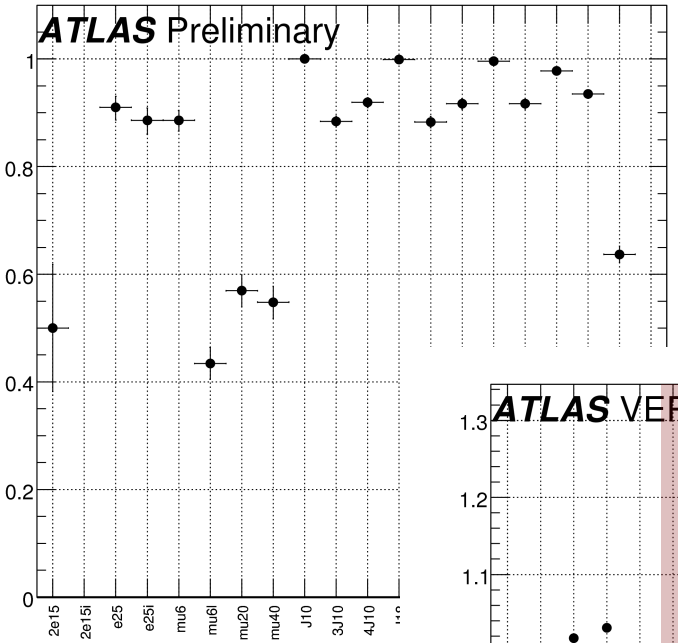
Monitor Abs



'direct' L2Abs / J23XE50_L2Abs

Top-Physics at DESY Zeuthen – An Overview

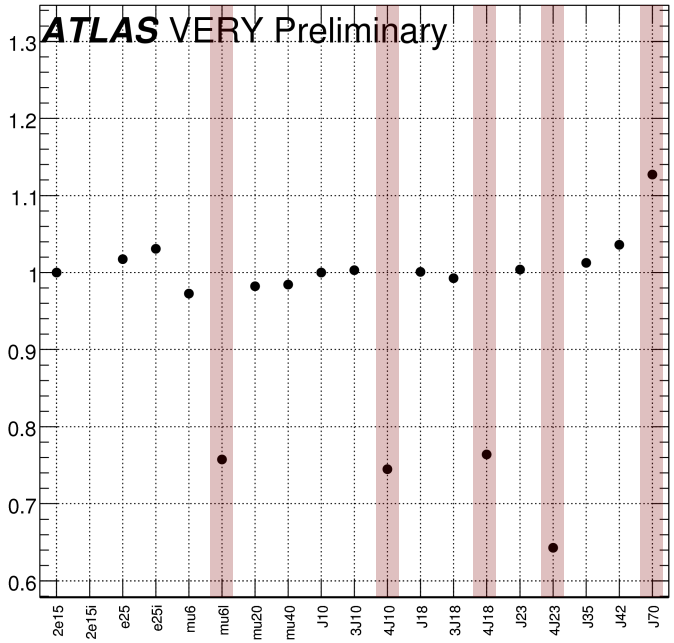
- Monitoring-Trigger Studies
  - 'effective' efficiency at Level 2:



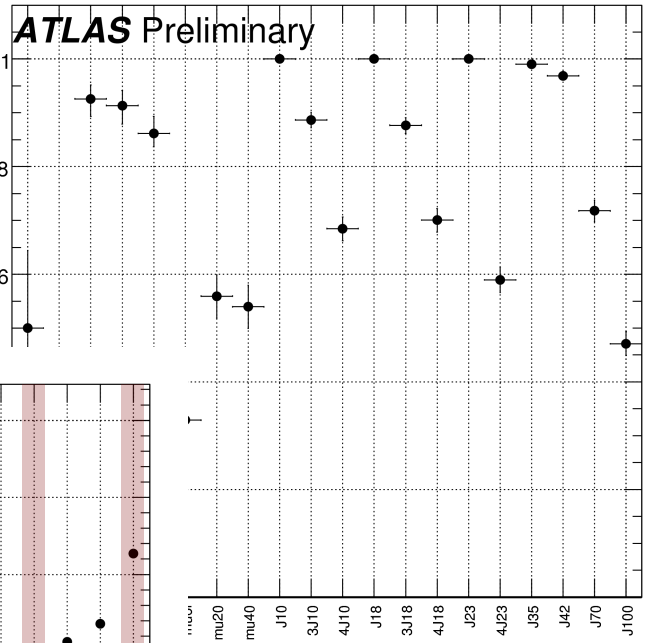
'direct' L2noKin to compare v

Count noKin

Ratio



'direct' count L2noKin / J23XE50_L2noKin

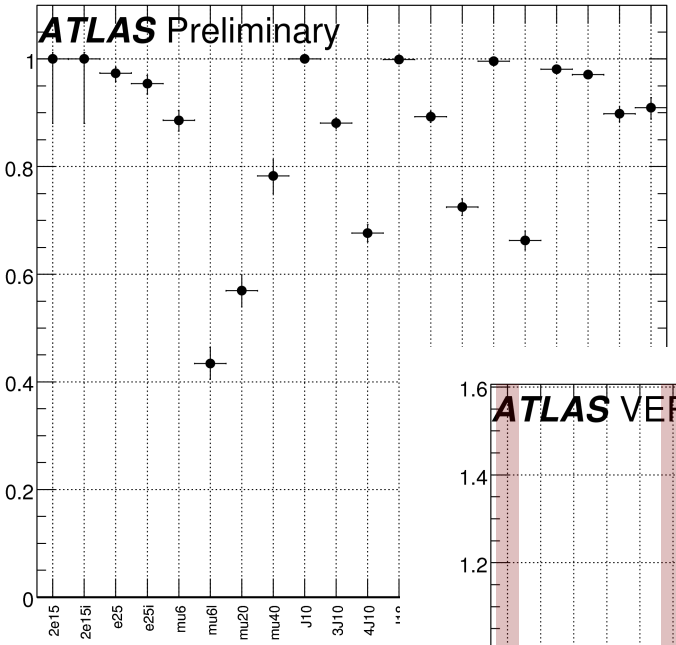


n Monitor

Monitor count noKin

Top-Physics at DESY Zeuthen – An Overview

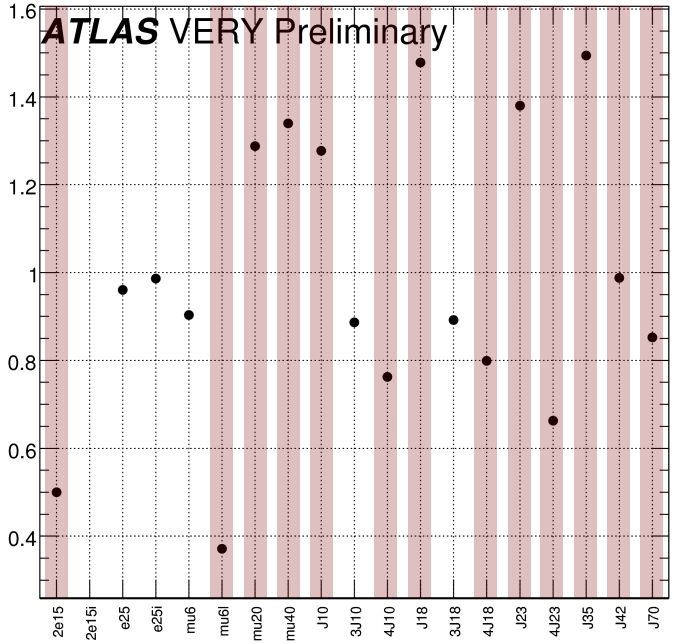
- Monitoring-Trigger Studies
  - 'effective' efficiency at Level 2:



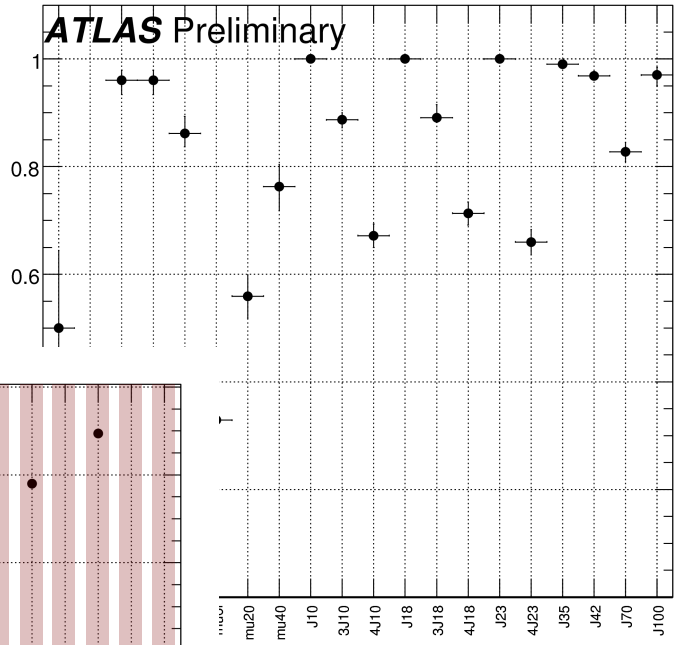
'direct' L2 to compare with J2

Count

Ratio



'direct' count L2 / J23XE50_L2



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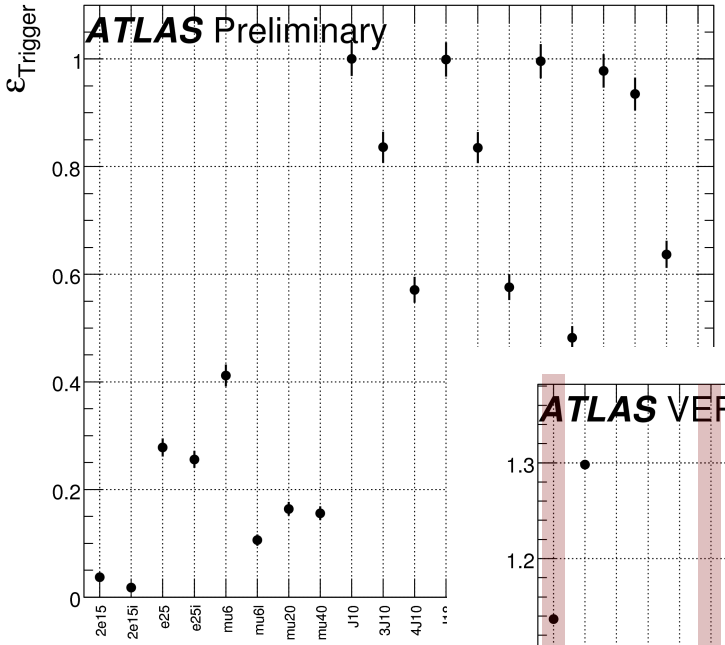
Monitor count

Top-Physics at DESY Zeuthen – An Overview

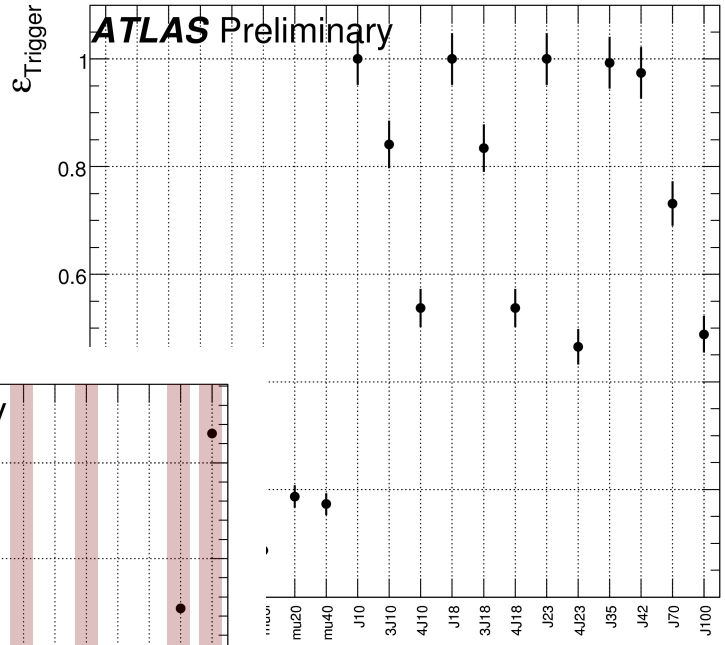
- Monitoring-Trigger Studies
  - 'absolute' efficiency at EventFilter:



TTbar_Lep

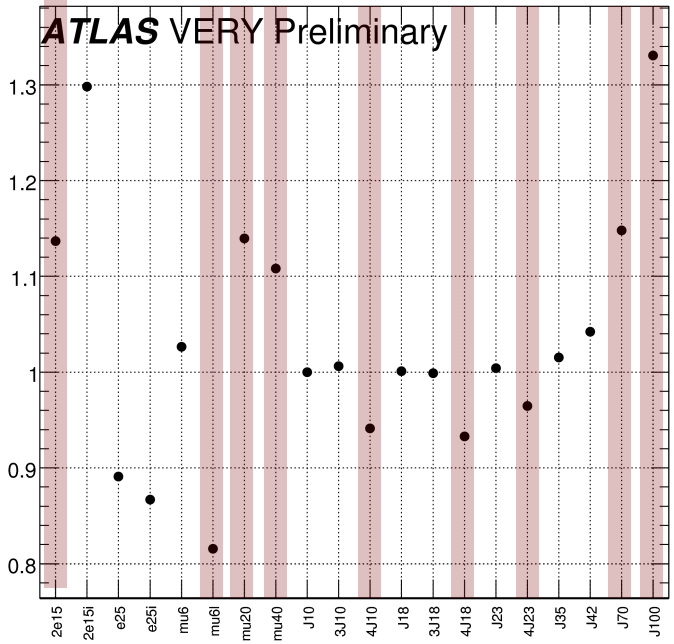
Abs

Ratio



Monitor

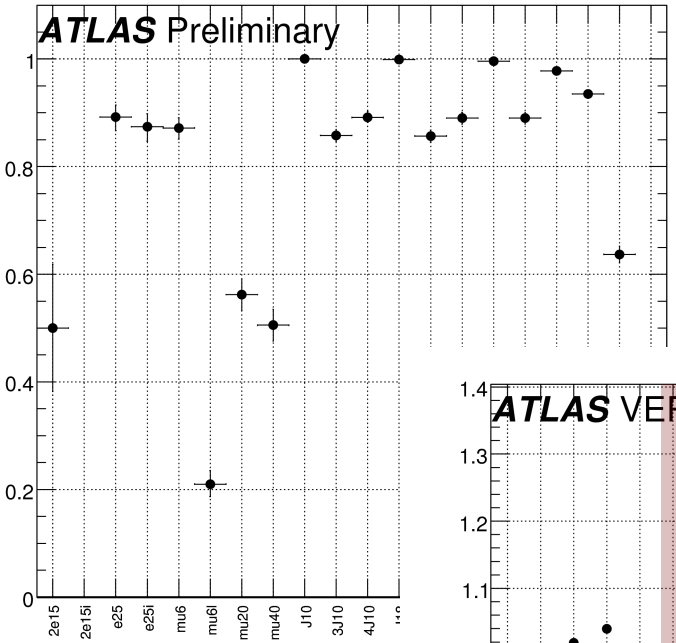
Monitor Abs



'direct' EFAbs / J23XE50_EFAbs

Top-Physics at DESY Zeuthen – An Overview

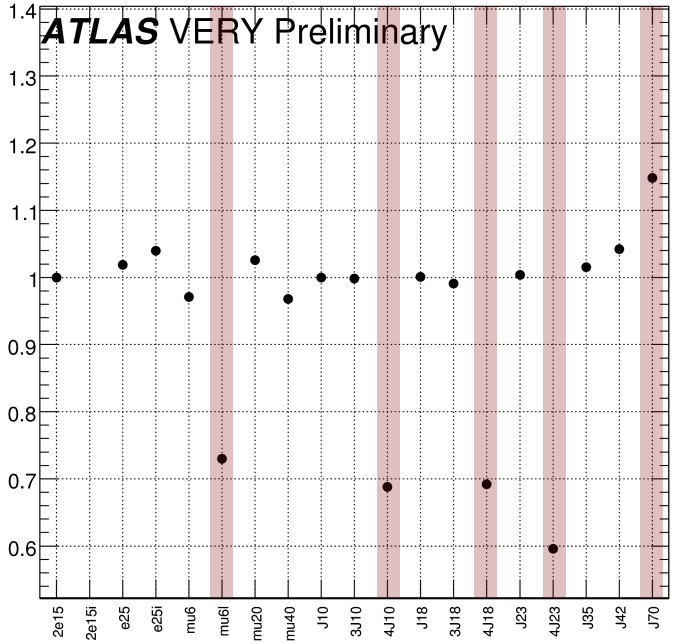
- Monitoring-Trigger Studies
  - 'effective' efficiency at EventFilter:



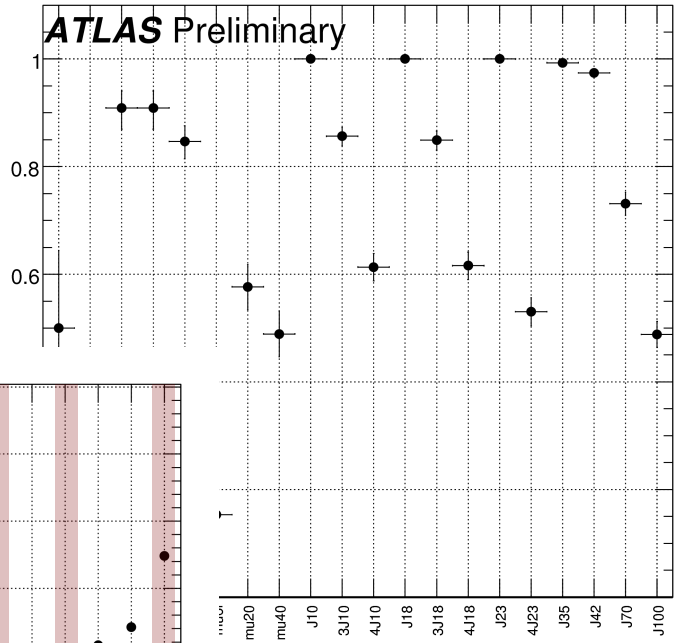
'direct' EFnoKin to compare v

Count noKin

Ratio



'direct' count EFnoKin / J23XE50_EFnoKin

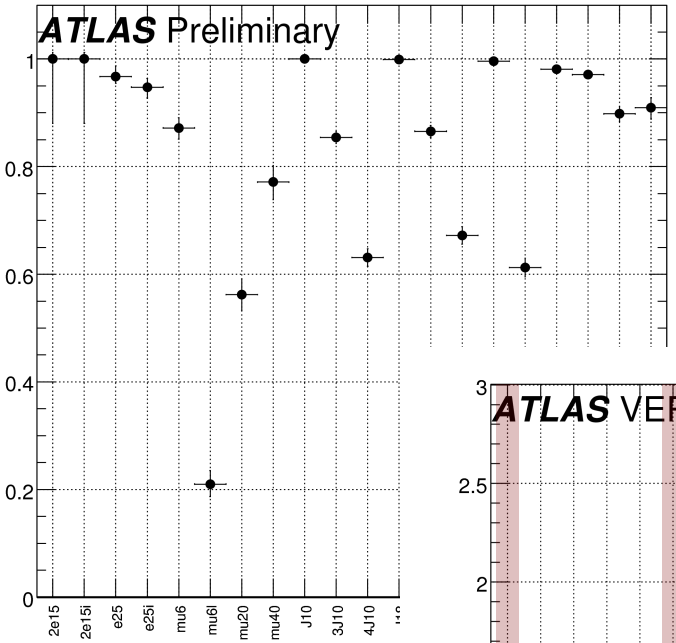


in Monitor

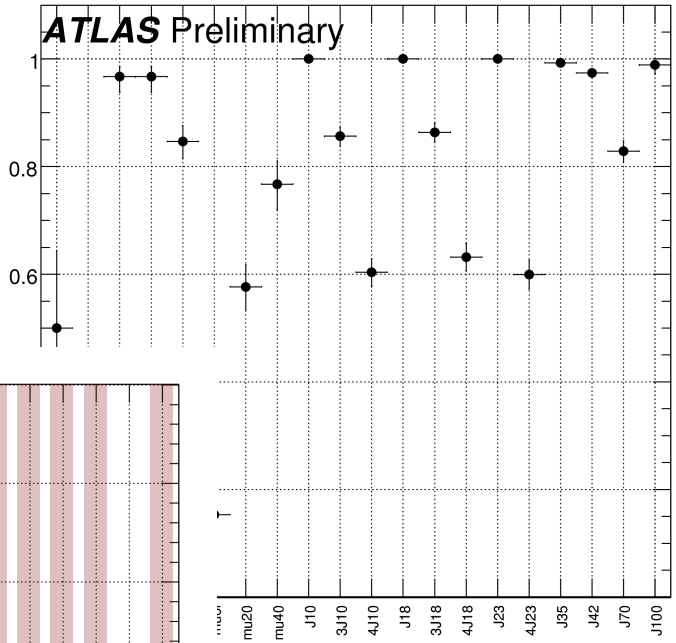
Monitor count noKin

Top-Physics at DESY Zeuthen – An Overview

- Monitoring-Trigger Studies
  - 'effective' efficiency at EventFilter:



Ratio

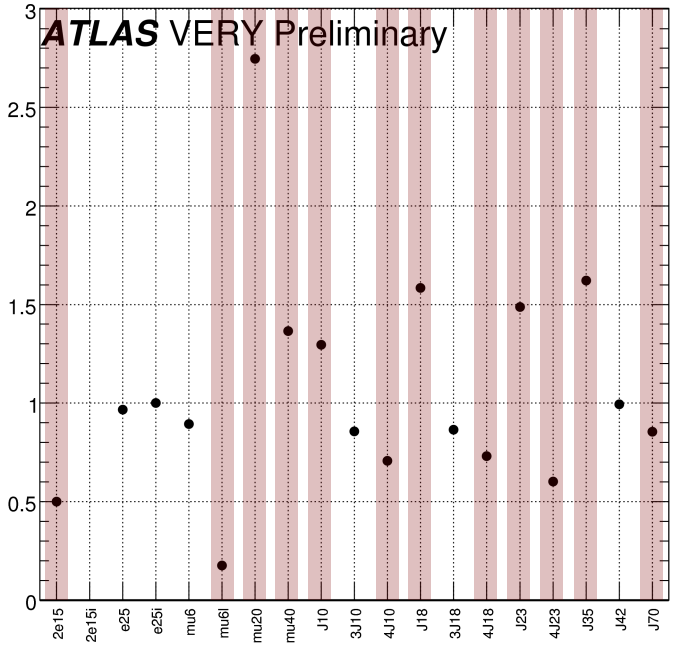


'direct' EF to compare with J2

nitor

Count

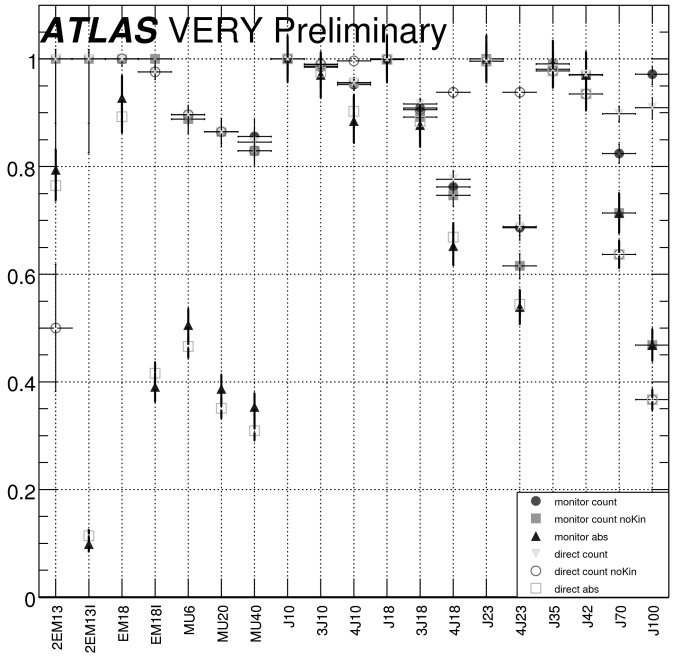
Monitor count



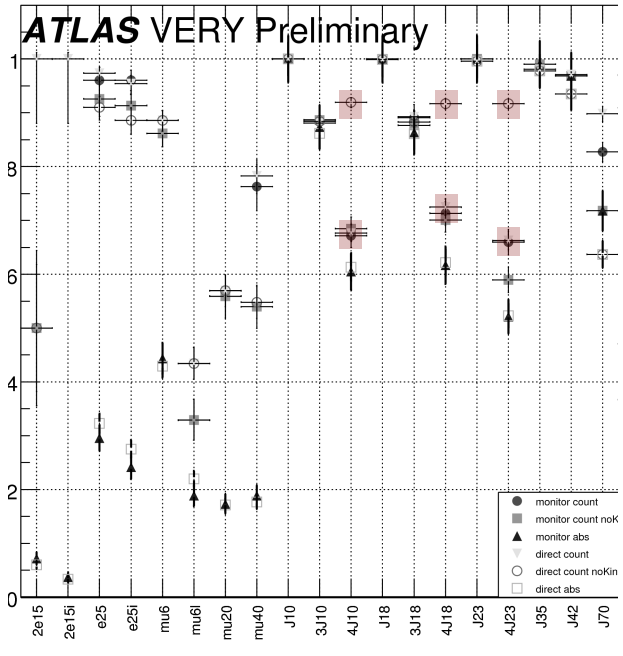
'direct' count EF / J23XE50_EF

Top-Physics at DESY Zeuthen – An Overview

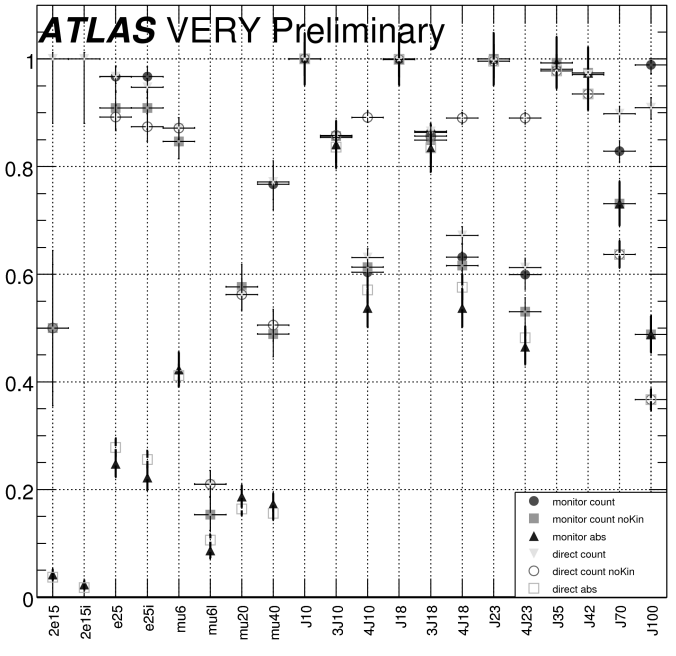
- Monitoring-Trigger Studies
  - comparison:



L1 compare methods



ompare methods



EF compare methods

Top-Physics at DESY Zeuthen – An Overview

- Future Plans
  - Finish started studies/projects
    - Monitoring-Trigger Study
    - Single-Top Selection Cuts
    - Data-Production for Top Working Group
    - Inclusive Selection Cuts for the Full Dress Rehearsal
  - Decide on some physics analysis topic