Tau Subgroup Introduction

SLAC ATLAS Physics Retreat

Eric Torrence

David Strom

March 5-8, 2007

Sarah Demers

Topics

- Tau Trigger
  - Validation (DS)
  - Timing Studies (SD)
  - Efficiency (ET)
- Tau Monitoring
  - Data Quality Monitoring, online and offline (ET,SD)
- Tau Physics
  - ttbar with hadronic tau decay (SD)

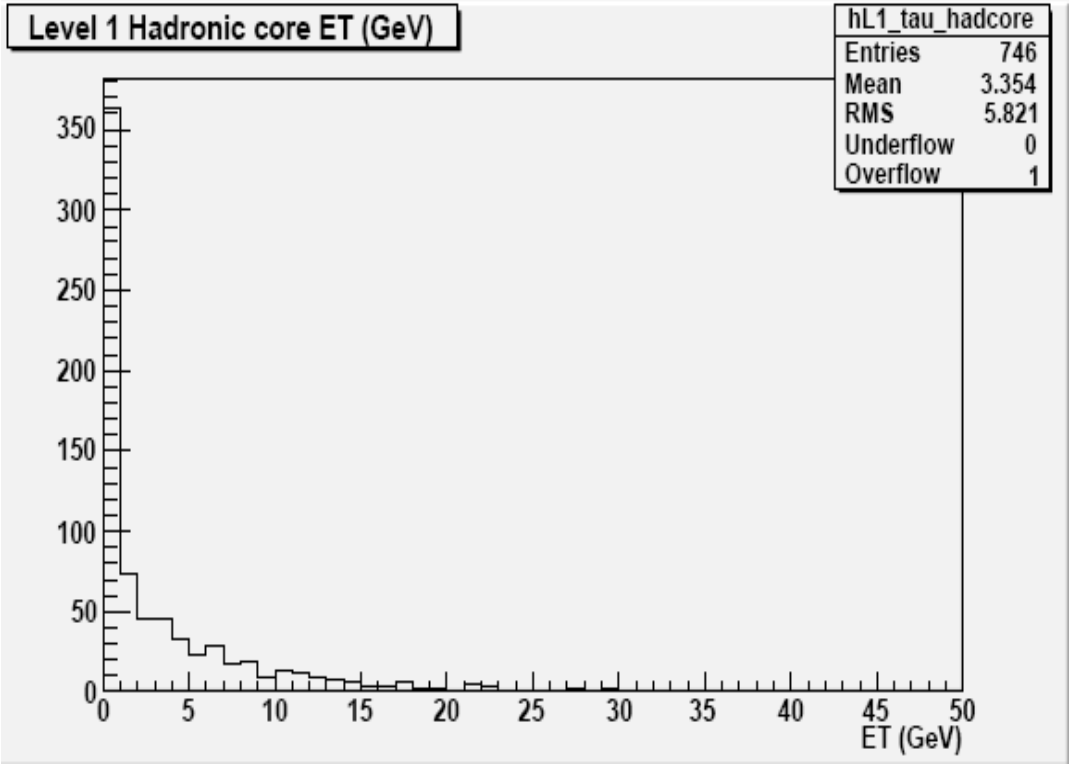
Tau Trigger Validation: David

https://twiki.cern.ch/twiki/bin/view/Atlas/TauTriggerValidation

- Check background and signal rates
- Check distributions of quantities produced in feature extraction algorithms
- Verify that algorithms can be re-run from AODs
- Validate changes to trigger configuration

Tau Trigger Validation

- Example distribution, from W->tau_{had} Monte Carlo
- Note that many hadronic taus do not leave a signal in the hadronic calorimeter at L1



Tau Trigger Timing Studies: Sarah

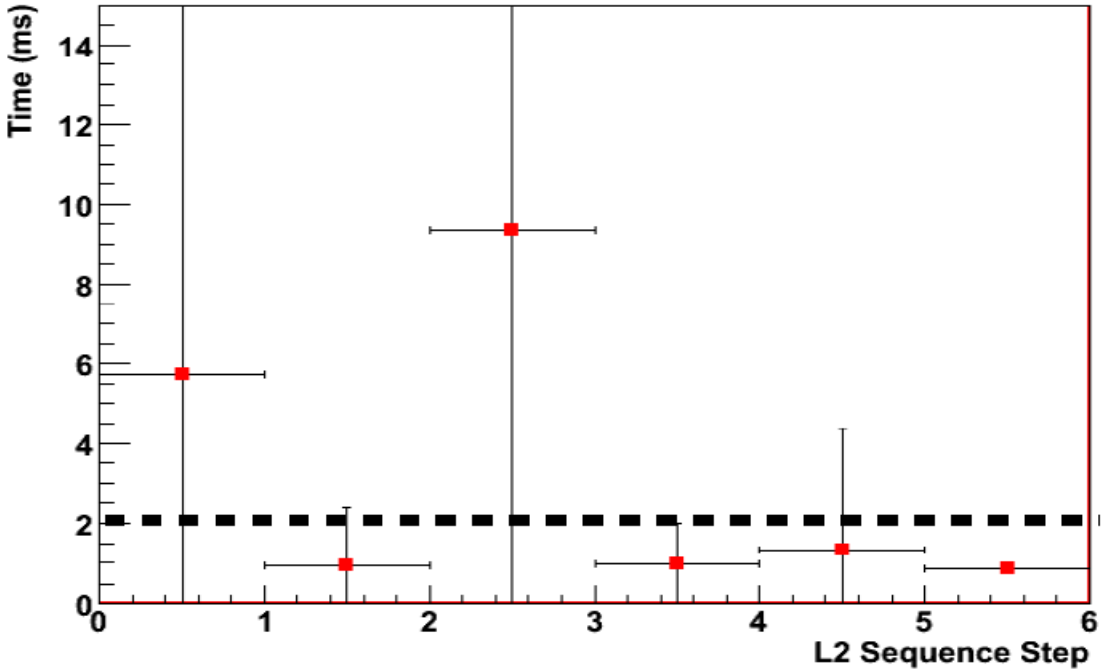
- L2: 20 ms latency, ~2.5 ms goal per alg
- EF: 2 s latency, ~0.25 s goal per alg
- What is the current (unoptimized) performance of the tau trigger?
  - Use TrigTimerSvc to measure total alg time, print results, and produce histograms
- Is caching of reconstruction information working correctly?
  - Run the trigger in various configurations over several Monte Carlo samples

Tau Trigger Timing Studies

- More info in following talk, but here is an example of the initial results from 350 W->tauhad Monte Carlo events

L2 tau10 Sequence

1) T2CaloTau_g4 (524)
2) T2CaloTauHypo_tau10
3) TrigIDScanMain_Tau (524)
4) T2IDTauHypo_tau10
5) T2Final_g4 (516)
6) T2TauHypo_tau10

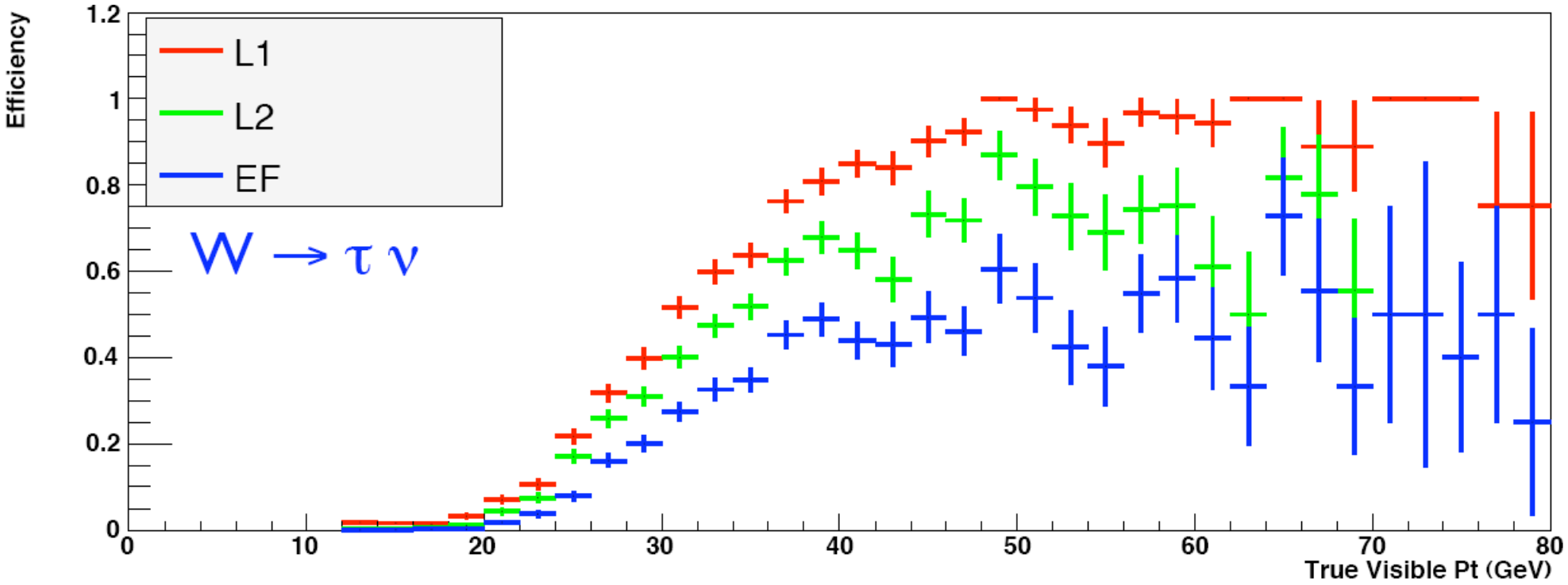


Tau Trigger Efficiency: Eric

- Measure efficiencies of current tau trigger menus with sufficient statistics to determine expected rates
- Optimize menus to give desired rates
- Investigate combining trigger menus as shown below (two-tau triggers, rates at 10^{31} cm^{-2} s^{-1})

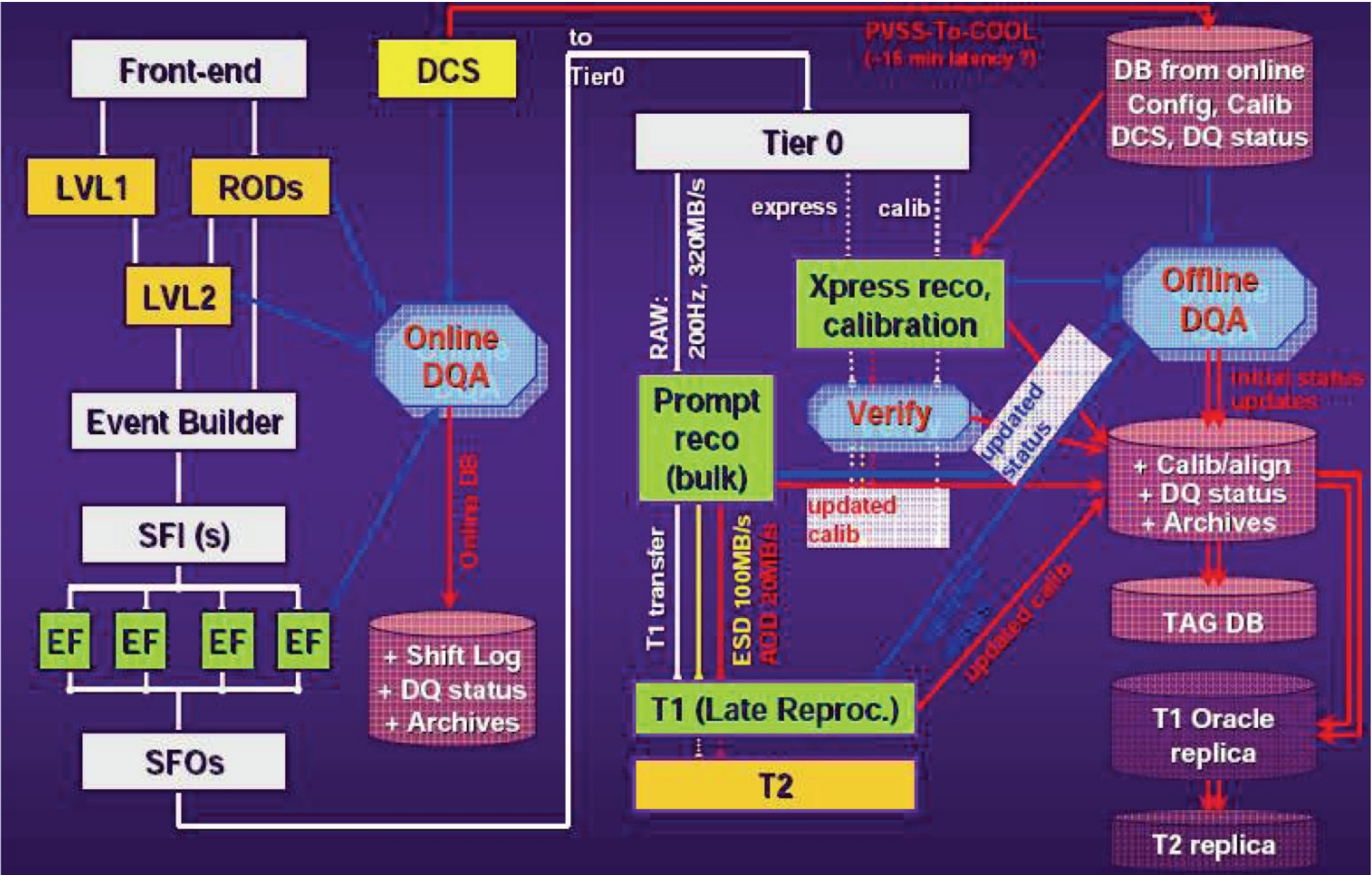
Selection	L1 Rate (Hz)	L2 Rate (Hz)	EF Rate (Hz)	$Z \to \tau\tau$ $(p_t^{\mathrm{vis}} > 12)$
2tau10i	1164	72	3.2	18.1 %
2tau15i	197	14	0.54	13.7 %
2tau20i	91	4.4	0.03	11.4 %

Tau Trigger Efficiency



- Example efficiency plot with the tau25i trigger with 12.0.5 code

Data Quality Monitoring



Data Quality Monitoring

- ~ 50 Flags in a data quality database for each luminosity block that specify whether or not data is “good”
- Goal for this workshop
  - Use offline tools in the Control/AthenaMonitoring package to get jobOptions and code in place to make a simple tau quality plot (ex: eta distribution)
- Long-term goal
  - Determine what histograms should be produced in order to specify data quality from the perspective of tau physics objects, and write necessary code

Tau Physics in ttbar: Sarah

- Investigate channel-dependence of tau ID efficiency
  - Following up on work in the fall of 2006 by Stanford Student Doug Applegate
- Make initial signal and background rate predictions
  - Is ttbar a reasonable physics channel to use to determine tau ID efficiency?

- There is a lot to do in the areas of tau triggers, tau monitoring, and tau physics. Let us know if you are interested in contributing to the effort!

- You will hear from us as the week progresses...