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# TRT RTT Validation

## Id Week

John Alison (University of Pennsylvania)

Doug Benjamin (Duke University)

Andrea Bocci (Duke University)

### Outline:

Introduction

Status

Further Plans



# Introduction

## - Goal:

Monitor the impact of the ATLAS software changes on the TRT performance ( “obvious” changes in TRT software/ other packages not in TRT domain)

## - Motivation:

Detect bad / wrong behavior of the TRT caused by updates and changes of the ATLAS software

## - Strategy:

Check a set of observables (i.e. histograms) related to the TRT performance produced on the nightly release and compare them with references obtained with a trustable/validated release

Comment: This is a purely Monte Carlo validation, observables related with hardware behavior cannot be monitored in RTT (unless the effect is somehow simulated...)



# Recent Developments

- Developed TRT RTT monitoring tool within the TRT athena monitoring package
  - designed to monitor performance of single, monochromatic particles (electrons, pions, muons 50 Gev, flat in eta and phi)
  - monitors sim/digi/reco chain
  - added RTT folder in the standard monitoring root file
- Monitor the monitoring
  - TRT monitoring itself is now part of the chain
    - => it also needs to RTT monitored
  - Standard sample of ttbar events used here

Previously, unofficial custom ntuples used.

TRT Monitoring gives less overhead, maintenance, debugging



# DCube

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- RTT results now analyzed through DCube
- Framework used by DQMF to compare two versions of a histogram with various algorithms (chi2, bin-by-bin, K-S ect )
- Plots posted directly to the web (easy for offsite/non-expert people)



# DCube

4.669DCube by Krzysztof Daniel Ciba - Mozilla Firefox (on localhost.localdomain)

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http://abocci.web.cern.ch/abocci/tmp/dcube/TRT\_RTT/output.php

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ID week (30 June 2008 ... Gmail - Re: RTT - johnd... 4.669DCube by Krzy... TrtRttPlots < Atlas < ...

name	K-S test			$\chi^2$ test			"bin-by-bin" test			DCube status
/	—	—	—	—	—	—	—	—	—	✓
TRT	—	—	—	—	—	—	—	—	—	✓
RTT	—	—	—	—	—	—	—	—	—	✓
hAvgOccB	—	—	—	—	—	—	—	—	—	✓
hAvgOccECA	—	—	—	—	—	—	—	—	—	✓
hAvgOccECC	—	—	—	—	—	—	—	—	—	✓
hDriftTimeonTrkB	—	—	—	—	—	—	—	—	—	✓
hDriftTimeonTrkEA	—	—	—	—	—	—	—	—	—	✓
hDriftTimeonTrkEC	—	—	—	—	—	—	—	—	—	✓
hFracHLHitsOnTrk	—	—	—	—	—	—	—	—	—	✓
hHitToTrkDistanceB	—	—	—	—	—	—	—	—	—	✓
hHitToTrkDistanceEA	—	—	—	—	—	—	—	—	—	✓
hHitToTrkDistanceEC	—	—	—	—	—	—	—	—	—	✓
hNHitsonTrk	—	—	—	—	—	—	—	—	—	✓
hNTrks	—	—	—	—	—	—	—	—	—	✓
hOccPerEvent	—	—	—	—	—	—	—	—	—	✓
hToTonTB	—	—	—	—	—	—	—	—	—	✓
hToTonTEA	—	—	—	—	—	—	—	—	—	✓
hToTonTEC	—	—	—	—	—	—	—	—	—	✓

Done



# DCube

4.669DCube by Krzysztof Daniel Ciba - Mozilla Firefox (on localhost.localdomain)

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http://abocci.web.cern.ch/abocci/tmp/dcube/TRT\_RTT/output.php

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ID week (30 June 2008 ... Gmail - Re: RTT - johnd... 4.669DCube by Krzy... TrtRttPlots < Atlas < ...

name	K-S test	$\chi^2$ test	"bin-by-bin" test	DCube status
/	Fraction of High Level hits on the reconstructed track			monitored ✓
TRT				reference ✓
RTT				reference ✓
hAvgOccB				reference ✓
hAvgOccECA				reference ✓
hAvgOccECC				reference ✓
hDriftTimeonTrkB				reference ✓
hDriftTimeonTrkEA				reference ✓
hDriftTimeonTrkEC				reference ✓
hFracHLHitsOnTrk				reference ✓
hHitToTrkDistanceB				reference ✓
hHitToTrkDistanceEA				reference ✓
hHitToTrkDistanceEC				reference ✓
hNHitsonTrk				reference ✓
hNTrks				reference ✓
hOccPerEvent				reference ✓
hToTonTB				reference ✓
hToTonTEA				reference ✓
hToTonTEC				reference ✓

Done

TRT RTT



# Plots Implemented

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Beyond the technical implementation the core of the entire RTT validation is the list of monitored plots/observables

Only with experience can we identify the plots most sensitive to software bugs

The RTT is a tool not a solution, it will not be able to detect all effects (particular small ones)

We are still the first line of defense and should validate our code independently



# Plots Implemented

Proposed Plot	Type	Is in TRT Monitoring?	Need Modification	Implemented in RTT	"Use in DCube"
Hits on Tracks	1D	yes	binning?	yes	yes
Recontruted q/Pt	1D			yes	yes
Occupancy vs Barrel Module	Profile	yes		yes	yes
Occupancy vs Endcap Wheel	Profile		yes	not yet	yes
High Level Occupancy vs Barrel Module	Profile	yes		yes	yes
High Level Occupancy vs Endcap Wheel	Profile	yes		no yet	yes
Drift Time	1D	yes		yes	yes
Hit/Track Distance	1D	yes		yes	yes
Occ per Event	1D	yes		yes	yes
nHits per Event	1D	yes	replaced	no	no
Num reconstructed tracks	1D	yes		yes	yes
TOT	1D	yes		yes	yes
Trailing Edge	1D	yes		yes	yes
Leading Edge	1D	yes		yes	yes
Wire/Track Distance	1D				
RT relation	2D				

<https://twiki.cern.ch/twiki/bin/view/Atlas/TrtRttDocumentation>





# Plans

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- Iterate the plots, binning ect. through feedback, experience
- fill holes / find missing links
- Develop and automate tests detect changes (for good/worse)
- Run on previous releases, with known TRT problems, ensure sensitivity
- Integrate with Inner Detector RTT