Track Trigger Simulation Status and Plans

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Presentations Today

- I will give an overview on the status and plans of the track trigger simulation in this talk.
- Mike W. will present the status of the implementation of the geometry and porting to CMSSW_2_2_3 in his presentation.
- Andrew R. will then discuss in more detail the status of trigger primitive generation including status of stub and tracklet finding.

Nomenclature

- Lack of an agreed nomenclature for the stacked tracking has lead to some confusion earlier.
 - We have documented the proposed naming convention on the wiki:

https://twiki.cern.ch/twiki/bin/view/CMS/SLHCTrackerTerminology

 This has been circulated and there has not been any objections. So I think we can now assume that this is accepted by all parties involved in this project.

Terminology



Stack:pair of closely spaced sensors (~1mm) 1.7 Stub:correlated pair of hits in stub Double stack:Two stacks separated by few cm. 2.5 Tracklet A matched pair of stubs.

A layer is one stack in this talk.



Goals of the Track Trigger Simulation Group

• Goals set for fall 2008:

Provide tools to generate track primitives – stubs

- Based on the geometry(ies) provided by the tracker simulation group
- Basically accomplished. Details in Andrews talk.
- Longer term goals starting now
 - Study the performance of stub and tracklet finding
 - · Efficiencies, fake rates, pt resolution etc.
 - · Andrew will show some intial results.
 - Work closely with muon, electron, tau, jets trigger groups to evaluate the performance of the track trigger primitives for triggering

Strawman Geometry

Currently we are working with the 'FNAL' geometry

Baseline upgrade design presented at Fermilab workshop 21th November 2008



Alternative Geometry

- Many people think that we should also consider a more 'conservative' geometry.
- This would have two trigger layers (stacks) at an inner radius of ~25 cm and an outer radius of ~50 cm. In addition to these trigger layers standard tracking modules would be placed approximately uniformly in radius for optimal tracking performance. (Important for pattern recognition.)
 Personally I feel that having an more orthodox strawman to compare with is important.
- I would hope that this is something that can be provided by the upgrade simulation group.

Plans – 1-2 months

- The exact geometry with the 'hermetic double stacks' still needs to be implemented.
- Code needs to be ported to 2_2_3.
 - Mike W. will tell us more about the status and progress here.
- Validation of the code for track stub generation will continue in
 - 1_8_4 while we wait for 2_2_3 to be available.
 - People working on this Andrew Rose, myself, (+ some at Cornell?)
 - •Also need to fix problem with full simulation?
- When we have 2_2_3 and a proper implementation of the FNAL geometry we should produce a set of samples.
- At the same time we should start developing algorithms to match stubs (or tracklets) to muon or electron L1 objects.

Plans – 3-6 month

• For the track trigger primitives:

- Develop a more detailed understanding of rates, resolutions efficiencies, and fake rates as a function of parameters like pixel size, spacing in stacks, sensor thickness, etc.
- Study clustering and effects of Lorentz drift.
- People: Andrew, Anders, CU RA, others?
- For electron and muon triggers (+ taus and jets)
 - Continue development off matching algorithms
 - Using the produced samples start study trigger algorithms.
 - In particular, we should address how information at different radii can be used. E.g. how useful is a trigger layer at an outer layer for electron id.
 - People: Hopefully many, Florida, TAMU, Wisconsin, Cornell, IC, Bristol...

Plans – beyond 6 month

- At this point, end of summer '09, we should have a fairly good idea of what algorithms works and don't work.
- I think that at this point we will need to review what our strawman detector should look like.
 - Could be that we are happy with what we picked today; but I don't think this is obvious.
- •We need to agree on a layout that we study in more detail.
 - This work would continue and be the basis of the LOI in 2010.

Status and Plans

 We have a official (in CVS) code for track stubs (and tracklet) simulation now.

This code is accessible for anyone to run.

•We are working on understanding and validating this code.

 The next step is to start using these track trigger primitives to study L1 trigger objects such as electron and muons.

Some References

 The geometry utilities are described at: https://twiki.cern.ch/twiki/bin/view/CMS/ SLHCStackedTrackerTools

 Instructions on how to use the geometry utilities can be found at: https://twiki.cern.ch/twiki/bin/view/CMS/ SLHCStackedTrackerToolsTutorial

 More info about data formats and instructions on how to generate stubs can be found at: https://twiki.cern.ch/twiki/bin/view/CMS/ TrackTriggerHitsAndStubs