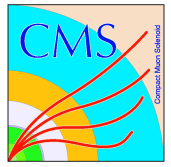

Alignment Technical Triggers

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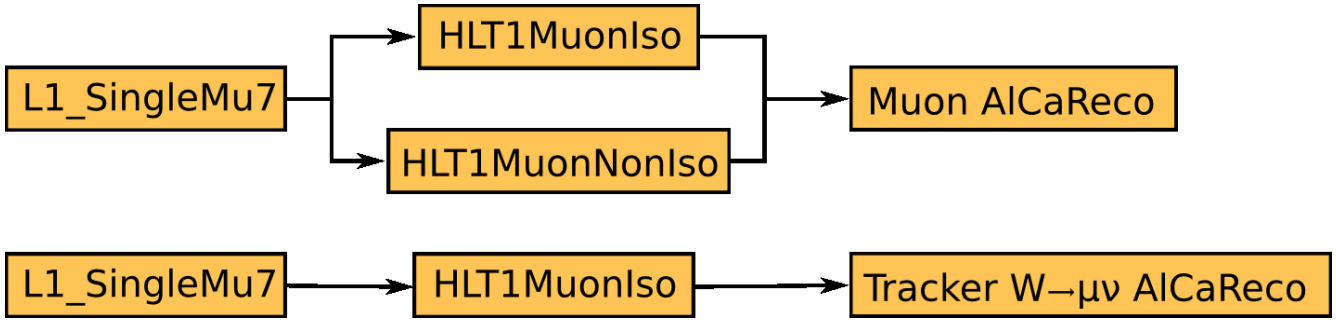
Texas A&M University

28 February, 2008

Introduction

Most of the alignment tracks will be collected on paths such as



- Based on conventional triggers
- Validated and published to 2_0_X

Moreover, in early data, the roads defining "L1_SingleMu7" can be widened (and in muon endcap, coincidence need not be required)

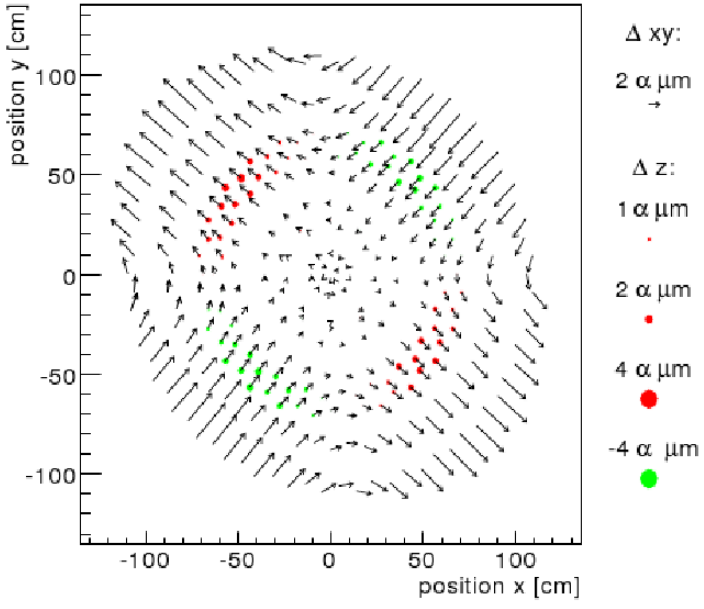
"Open muon" running would be useful in

- CRAFT (May–June)
- Beam-halo from single-beam (June)
- Low-luminosity collisions (July?)

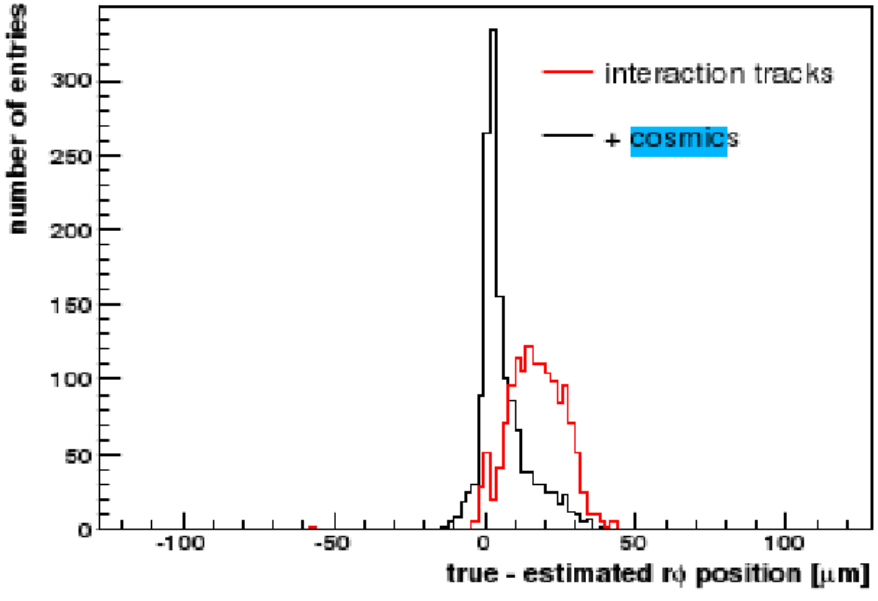
However...

- Nice to have a backup trigger that explicitly selects the kinds of events we're likely to see
- Even in the long-term, we'll want non-I.P. tracks
  - rate not tied to luminosity
  - improve convergence

Example of a weak mode, poorly constrained by I.P. tracks alone



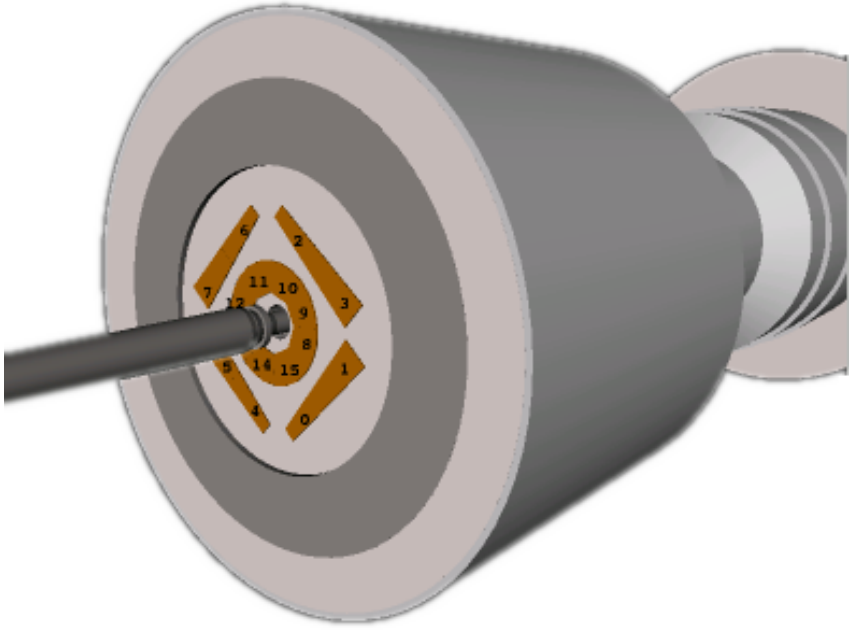
Simulated tracker alignment **with** and without cosmics



Sources of non-I.P. tracks

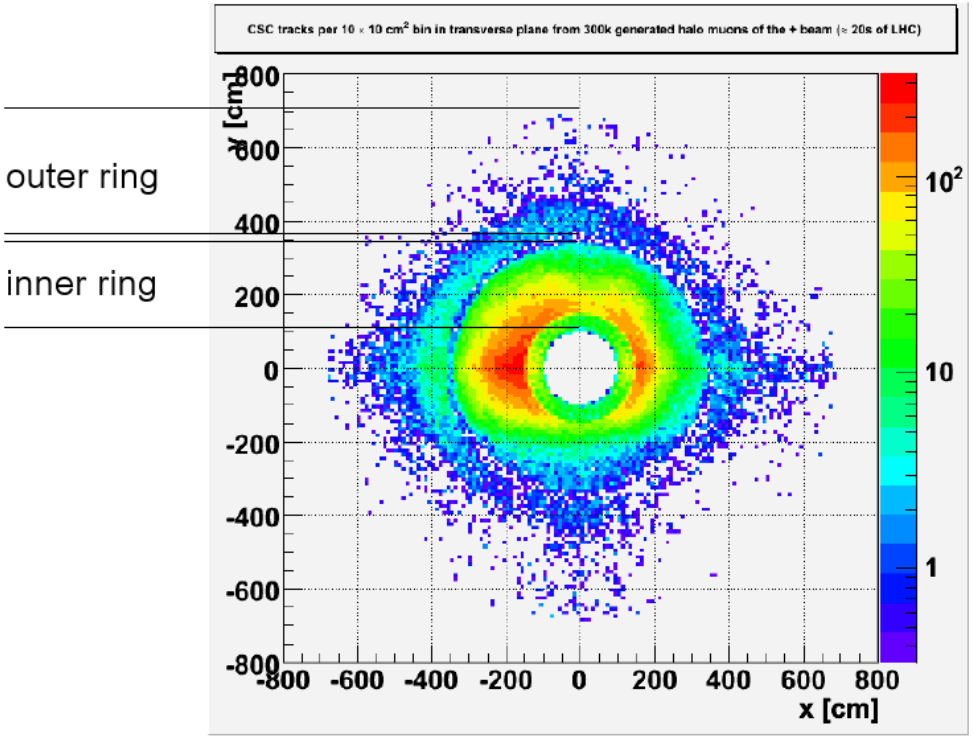
Two categories:

- Cosmics
  - best for barrels
  - tracker has expressed an interest
  - trigger from RBC
- Beam-halo
  - best for endcaps
  - tracker and muon systems are interested
  - disjoint intervals in radius, different triggering mechanism
    - Beam Scintillation Counters installed around tracker $\longrightarrow$
    - CSC beam-halo trigger from CSC trigger primatives

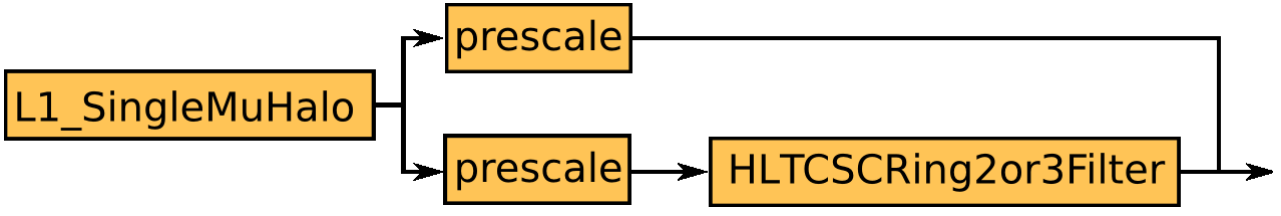


Beam-halo in CSCs

- Steeply falling function of radius
- Events in inner ring and outer ring are equally interesting



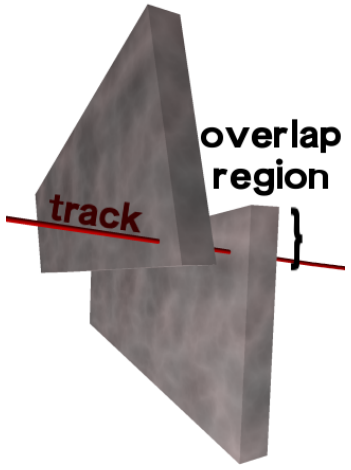
Two new HLT paths:



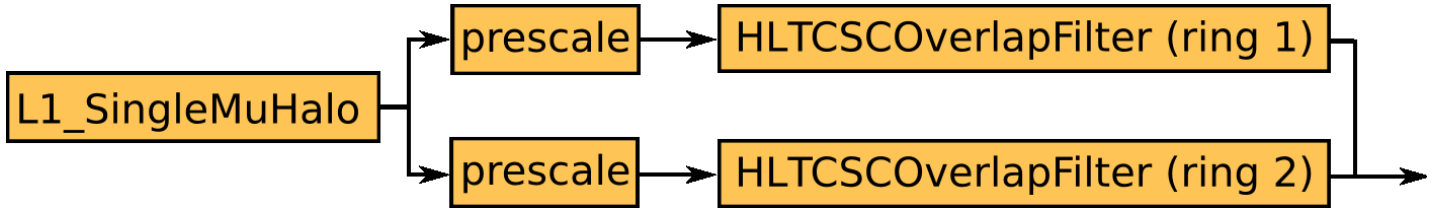
- HLTCSCRing2or3Filter selects at the level of RecHits
  - 4/6 outer ring hits within 2 cm of each other (customizable)

Beam-halo in CSC overlaps

- Tracks that intersect two neighboring chambers are particularly interesting
  - Get relative alignment of chambers without propagating track through iron
  - Design feature of CSCs, for alignment
  - Only about 5% of the CSC area

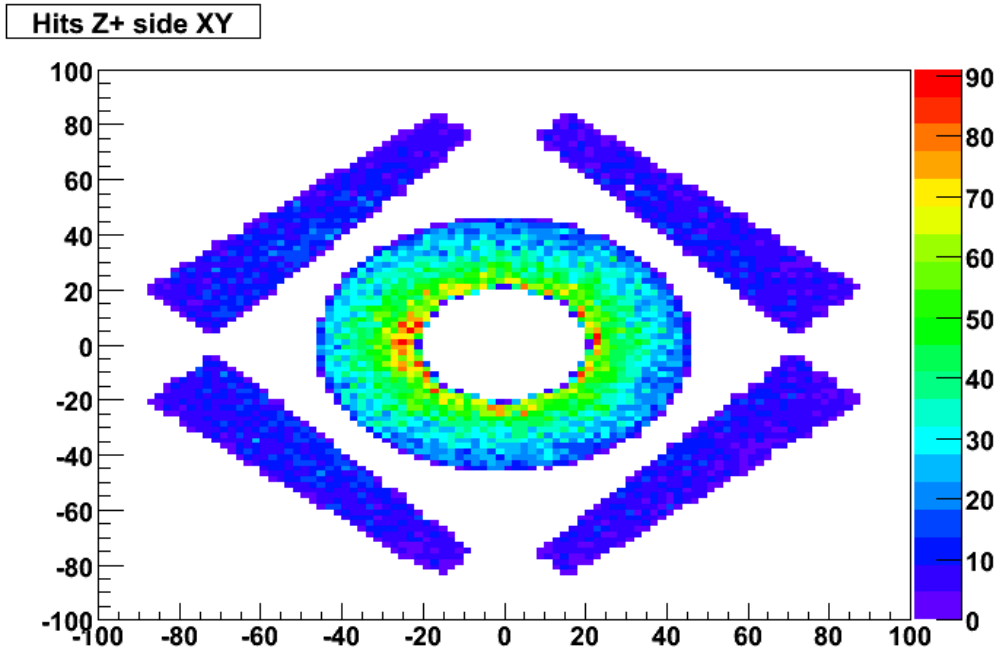


Two new HLT paths:



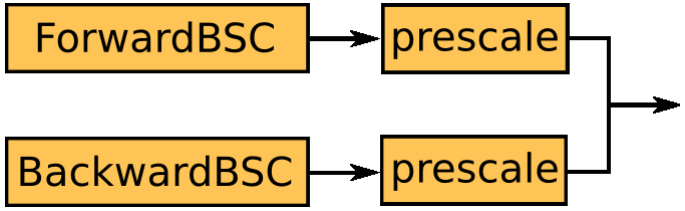
- HLTCSCOverlapFilter selects at the level of RecHits
  - 4/6 hits in each neighboring chamber within 2 cm (customizable)
  - Tuned in 10k MC

Beam-halo in the tracker



- Two L1 bits, one for forward, one for backward
- Rate is asymmetric: beam-halo from Salève $\gg$ from Jura
- L1 indexes are unknown, currently filled with placeholders ("1" and "2")

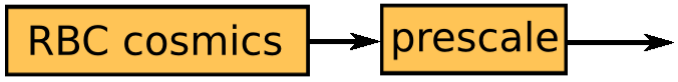
Two new HLT paths:



Cosmic rays in the tracker

- In the future, we'll want to select for pointing into the tracker
- Currently, just pushes through the L1 bit
- L1 index is unknown, currently filled with placeholder ("0")

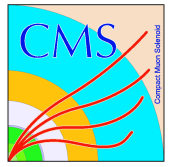
One new HLT path:



Configuration files in HLTrigger/special/data

- Tagged with V00-01-54, but not yet published
- Want to publish for 2_0_0, with "CandHLT" entries in HLTrigger/Configuration/data/main/Special.cff
- Future corrections to L1 indexes and prescales are bug-fixes
- All C++ code has been tested and tuned in MC

Conclusions



- Most alignment tracks collected the same way as physics muons
- Technical triggers collect non-collisions muons for extra rate and non-I.P. pointing
- 7 new HLT paths covering 4 use-cases
- We want to publish these to 2_0_0 so that they won't be rejected as "new features" in the future
- Still need to finalize L1 bits, some haven't been assigned
- Clearinghouse for alignment technical trigger information:
  https://twiki.cern.ch/twiki/bin/view/CMS/TechnicalTriggersRequirements