July Production Goals

- Evaluate major DG options
  - Forward PID and backwards Emc
  - Generate signal, generic bkg. to $B \rightarrow K^{(*)}\nu\nu$, $B \rightarrow \tau\nu$
- Include all known detector backgrounds
  - Rad Bhabha tertiaries from machine elements
    - neutrons, photons
  - Rad Bhabha primaries
  - Pair electrons
- 10X statistics of February production
- Required ~X20 efficiency improvement

FastSim Improvements

- Neutron interactions modeled in Bruno/G4
- Pair electrons filter (Svt dE/dx)
- Faster, more accurate EMC time response
- Detector-based PID selectors
  - instead of (Babar) tables
- Hadronic and Semileptonic Signal cocktails
  - preserve ~80% of relevant modes, ~10% of X-section
- Code improvements
  - background frame reading, hit merging, ...

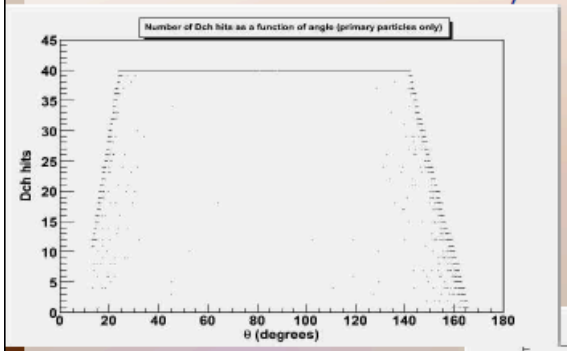
Net Result

- Effective event processing rate of ~20 Hz
- > 20X per-event rate of February production

Fastsim Problems in July

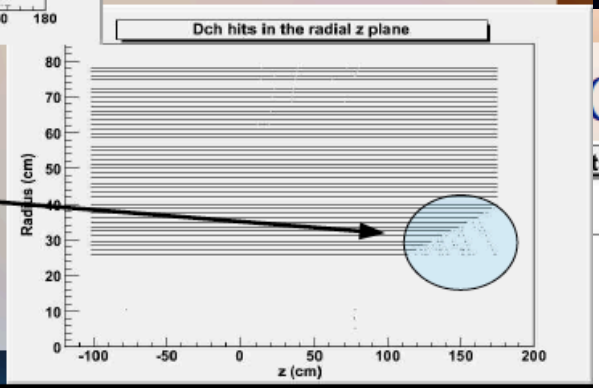
- Pair electron hits merged on pion tracks
  - confused dE/dx calculations, no selector efficiency
  - Fixed (in September) by removing merged hits from dE/dx calculation
- Pair filtering has low efficiency (more later)
- ⇒ Only include neutron backgrounds (nopair)
- Navigation problems
  - known problem, but had larger impact than expected

Baseline Geometry: Dch Pe

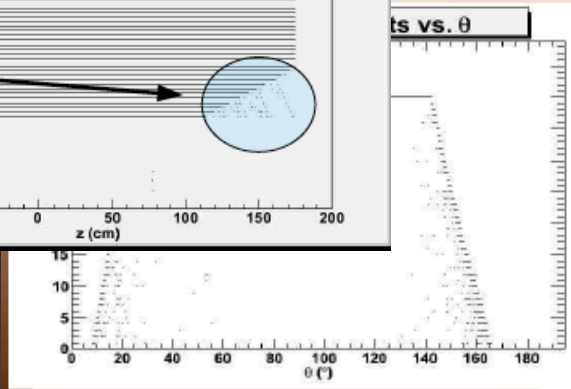


D. Swersky
Annecy meeting
V0.2.0

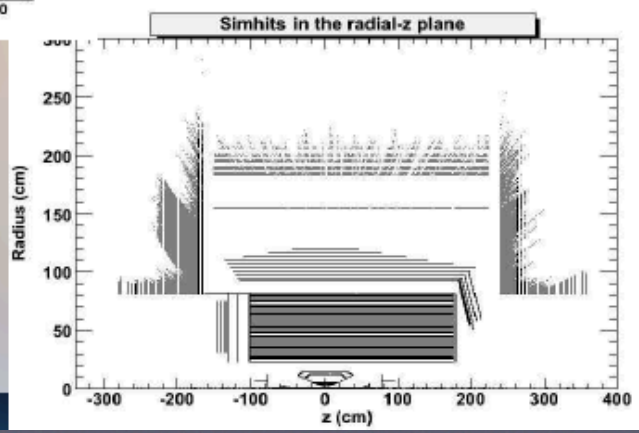
This clipping is actually seen on both sides of the drift chamber in geometries such as Longbwd. Could it be caused by SVT?



Geometry: Bugfix Results

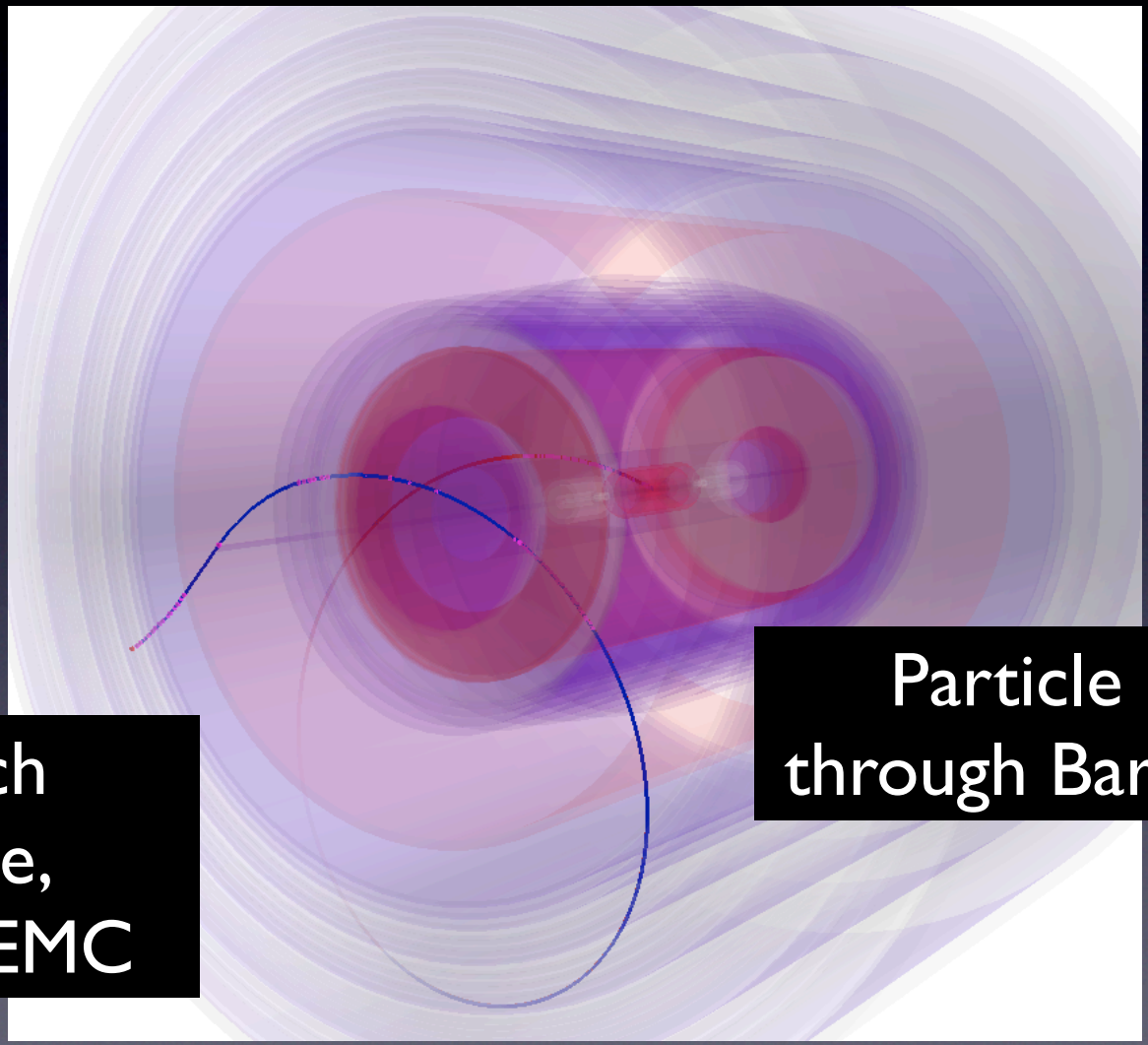


D. Swersky
FastsimV0.2.1



Dch problem gone after retuning 'gap' parameter in navigation, but...

Problems with large ‘gap’



Hits Dch endplate, forwards EMC

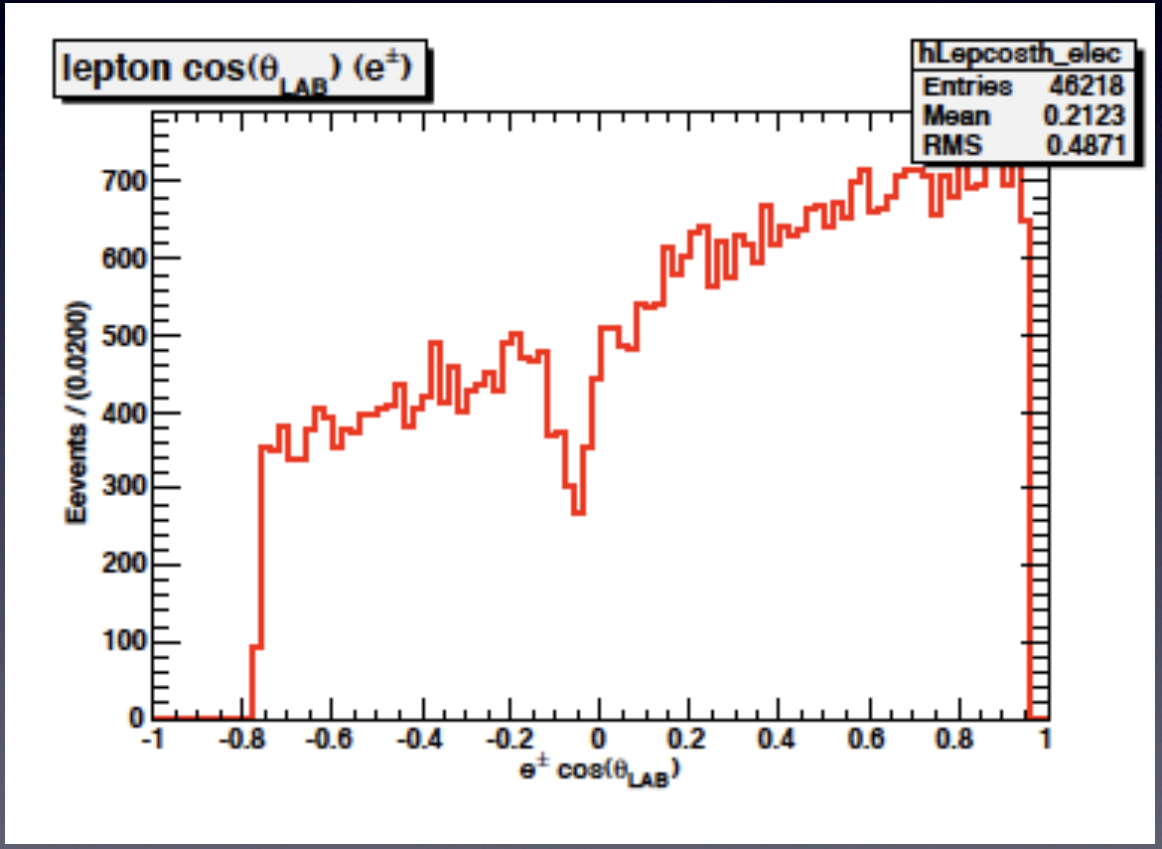
Particle passes through Barrel, Iron...

Fastsim Particle Navigation

- Old model: particle simulation navigation loops over detector elements in a fixed order
  - order set by configuration
- Works when particles have a well defined path
  - outwards through cylindrical shells (SuperB)
- Fails when particles come from ‘unexpected’ directions, or when elements have no fixed order WRT particle direction
  - Dch endplate vs barrel

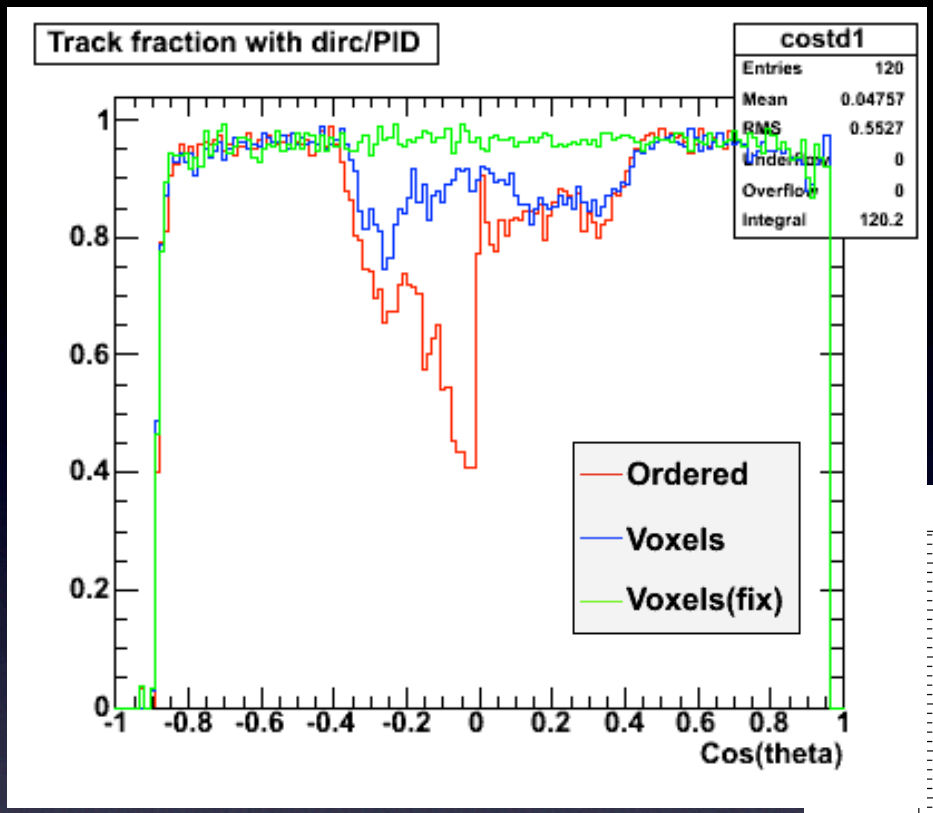
July Data Navigation Problems

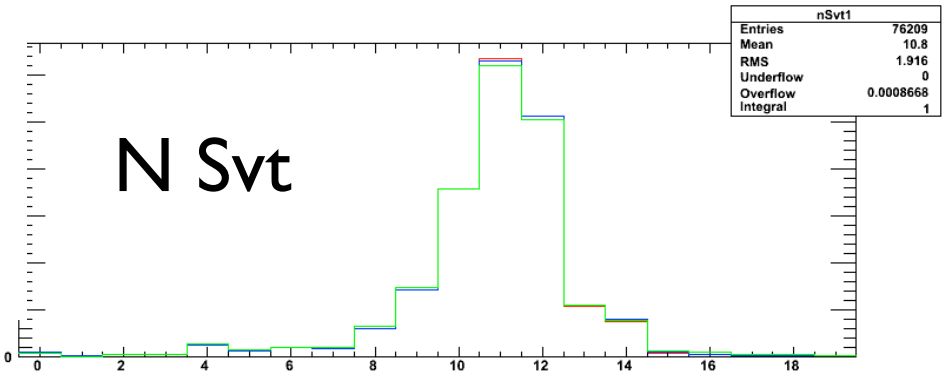
- Inefficiency in PID selection vs Cos(theta)
- Not believed to directly affect DG issues

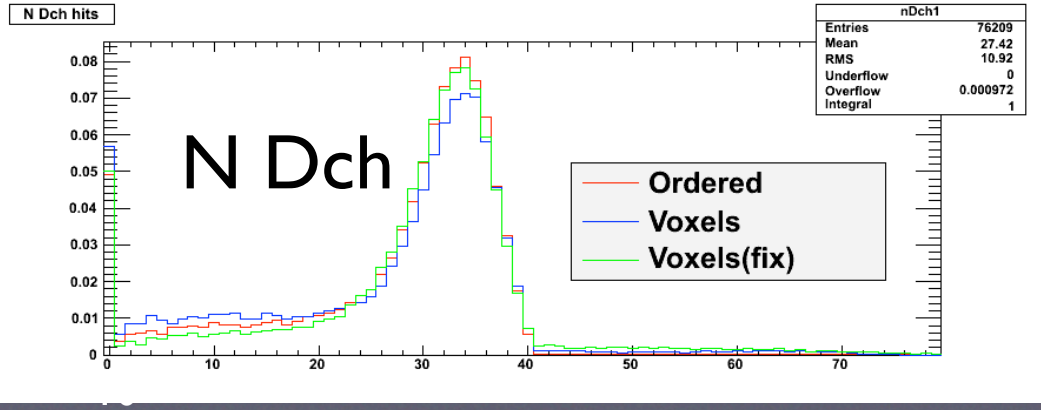


Voxel-based Navigation

- Detector volumes are divided into voxels
  - cylindrical geometry
- Voxels reference enclosed detector elements
  - No assumptions about element order inside a voxel
- Released in late August
  - ~2K lines of code, long debugging period

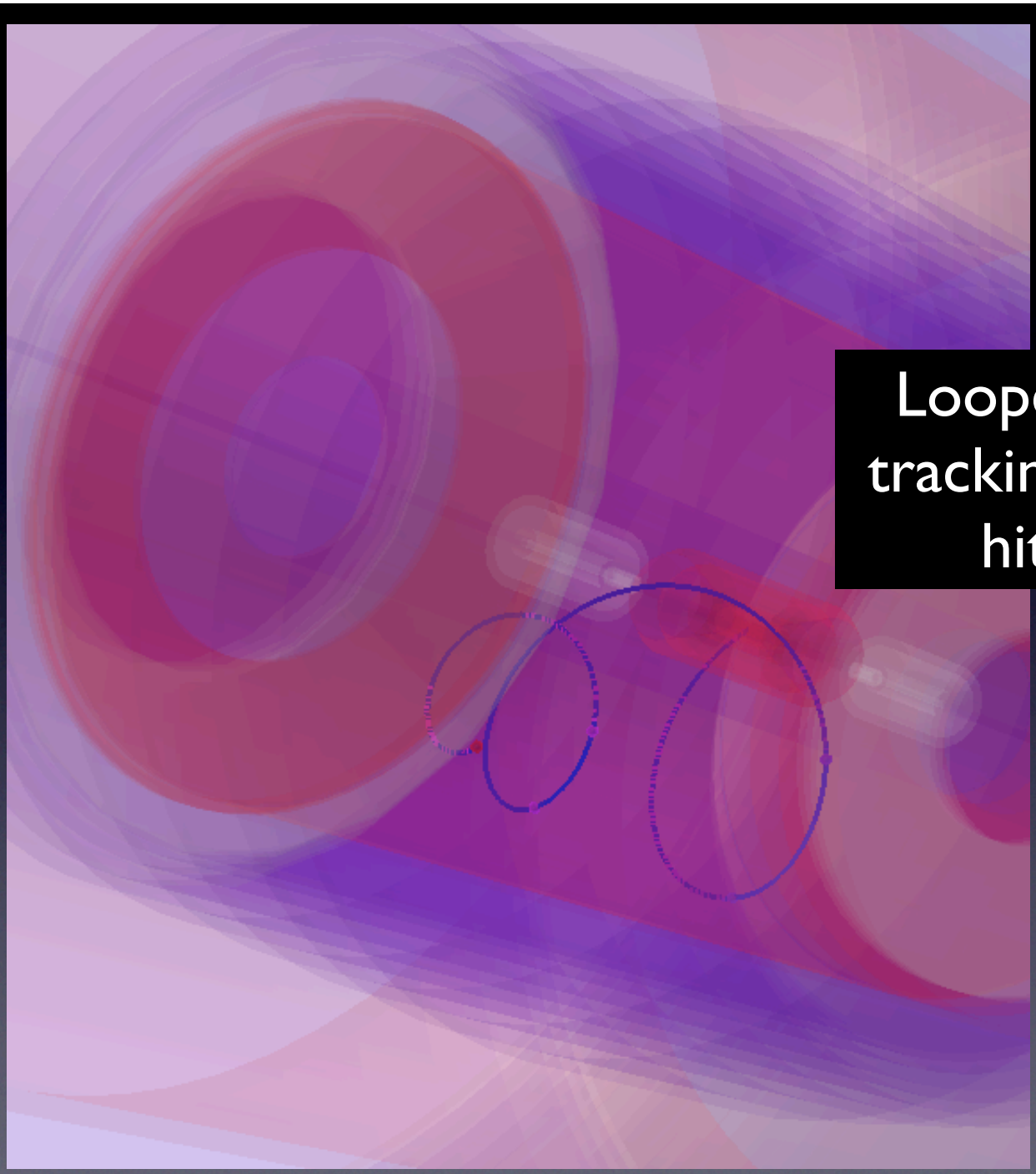

Track fraction with dirc/PID
costd1
Entries 120
Mean 0.04757
RMS 0.5527
Underflow 0
Overflow 0
Integral 120.2
Ordered
Voxels
Voxels(fix)
Cos(theta)


nSvt1
Entries 76209
Mean 10.8
RMS 1.916
Underflow 0
Overflow 0.0008668
Integral 1
N Svt


N Dch hits
nDch1
Entries 76209
Mean 27.42
RMS 10.92
Underflow 0
Overflow 0.000972
Integral 1
N Dch
Ordered
Voxels
Voxels(fix)

September Problems

- After Navigation fix, low Pt tracking inefficiency
  - energy loss changes trajectory, track fit fails
  - solution: ignore hits after significant energy loss
- Pair filtering exposed old BaBar bug
  - PID maps keyed to candidate pointers, not UID
  - ‘Solution’: limit electron selectors to >100MeV
- Pilot error updating release for production
  - build and validation are made by hand
- Fully functional executable not produced till 23 Sept.
  - ~1% of jobs fail due to code problems



Looper re-entering tracking volume after hitting DIRC

Why weren't problems found and fixed earlier?

- Insufficient manpower to develop and validate code and procedures required to meet production goals

Conclusions

- Technical goals of July production were met
  - Efficiency improvements
  - Background mixing
  - Navigation rewrite
- Not all fixes were available at production start
- Lesson for SuperB: more manpower is needed to meet experiment software goals