SVT baseline

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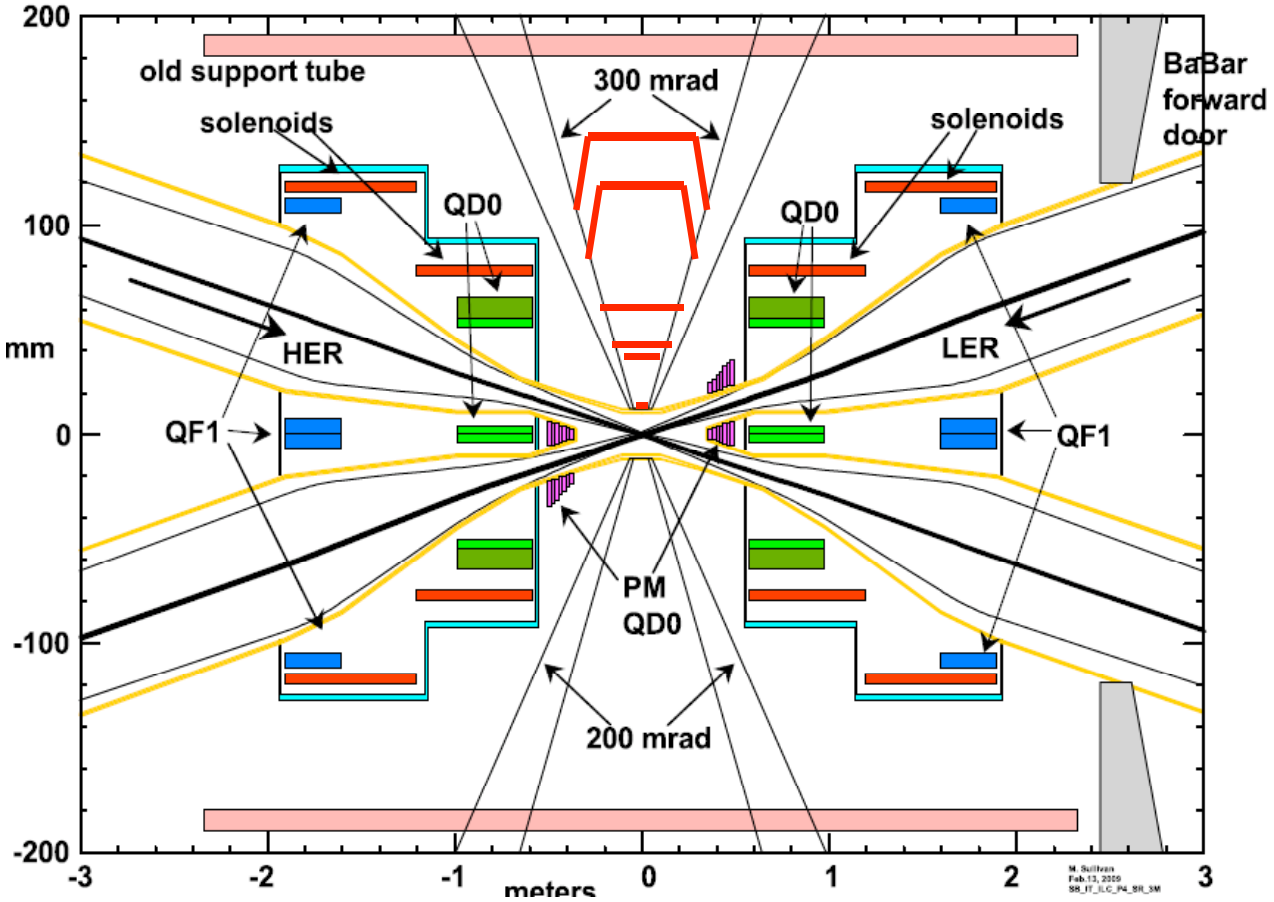
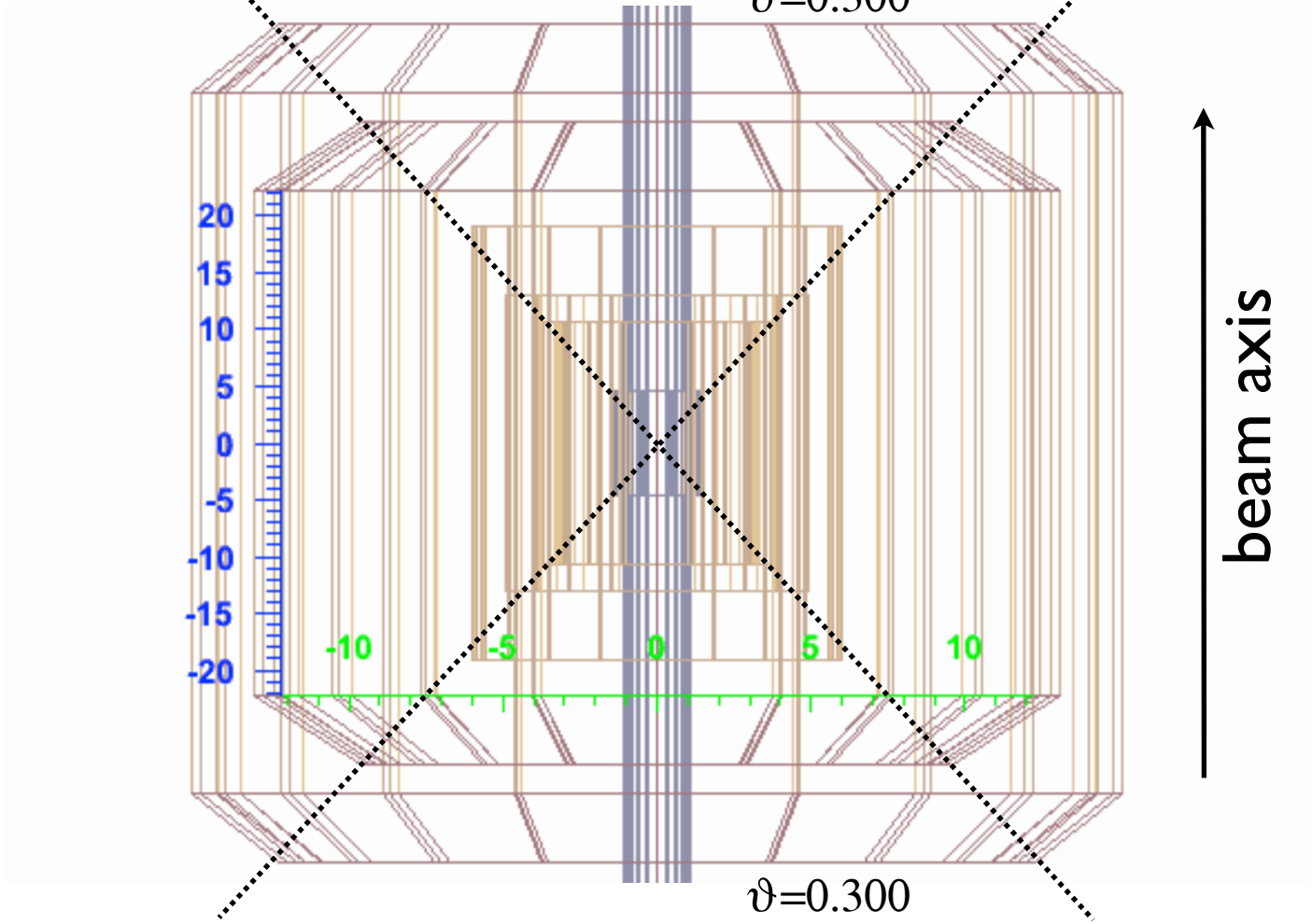
Università di Pisa & INFN
12 Maggio 2009

Angular coverage down to 300 mrad FW and BW

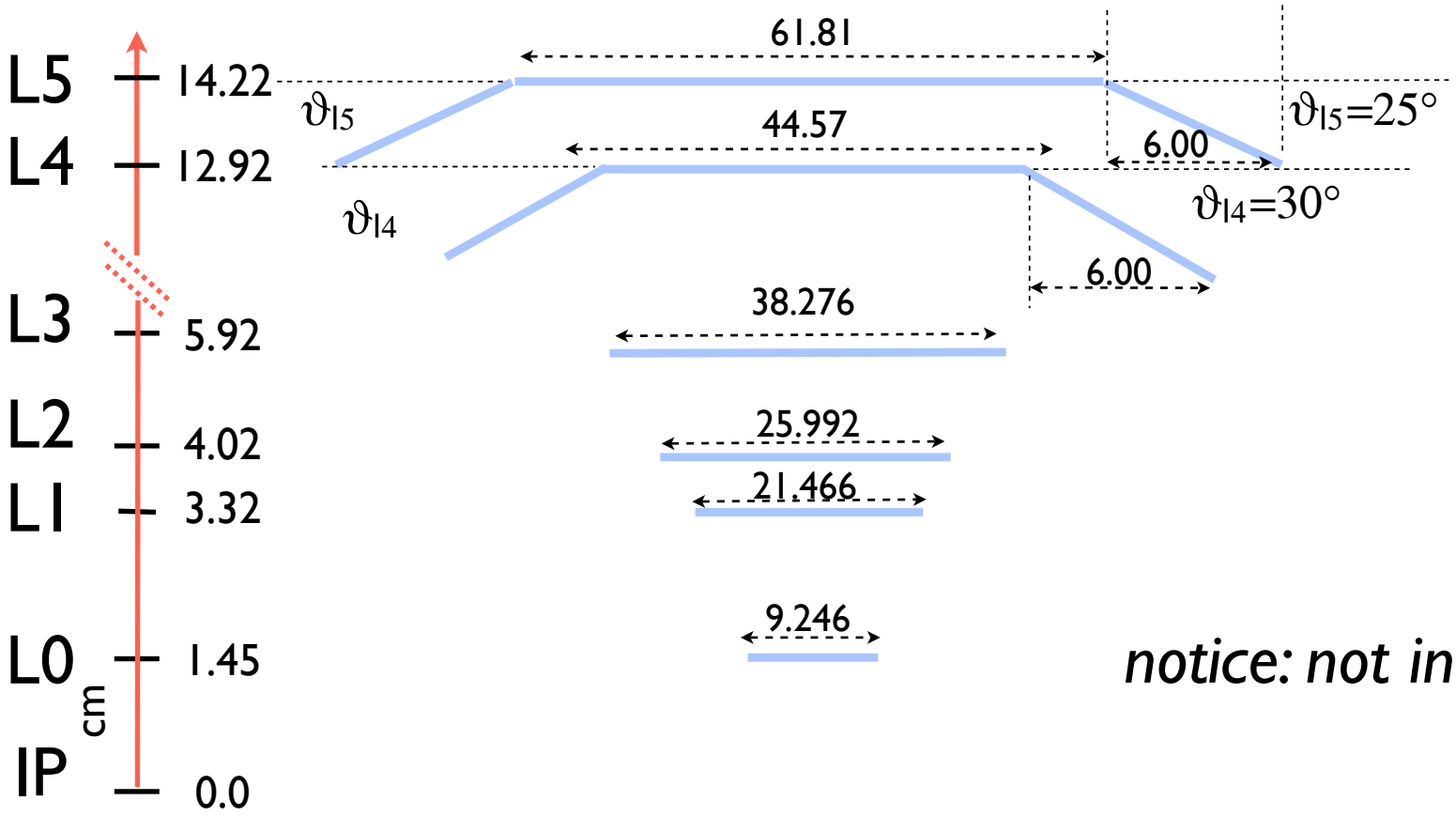


Display of SVT modules



angular coverage in CM ~ 95% (BaBar SVT ~89%)

SVT layer geometry for baseline

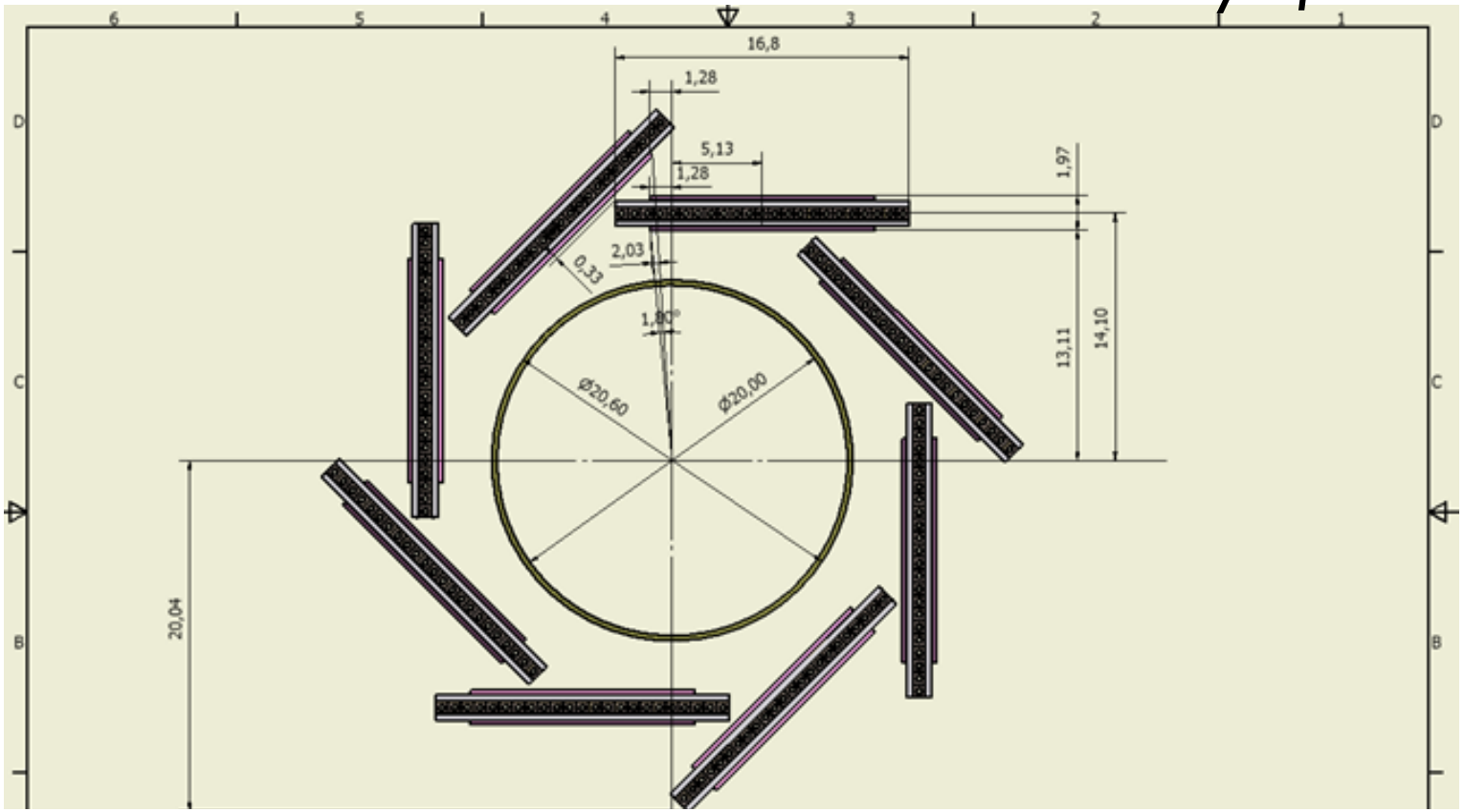


notice: not in scale

Coverage down to 300 mrad FW and BW

Pinwheel layout for L_0

courtesy of F. Bosi

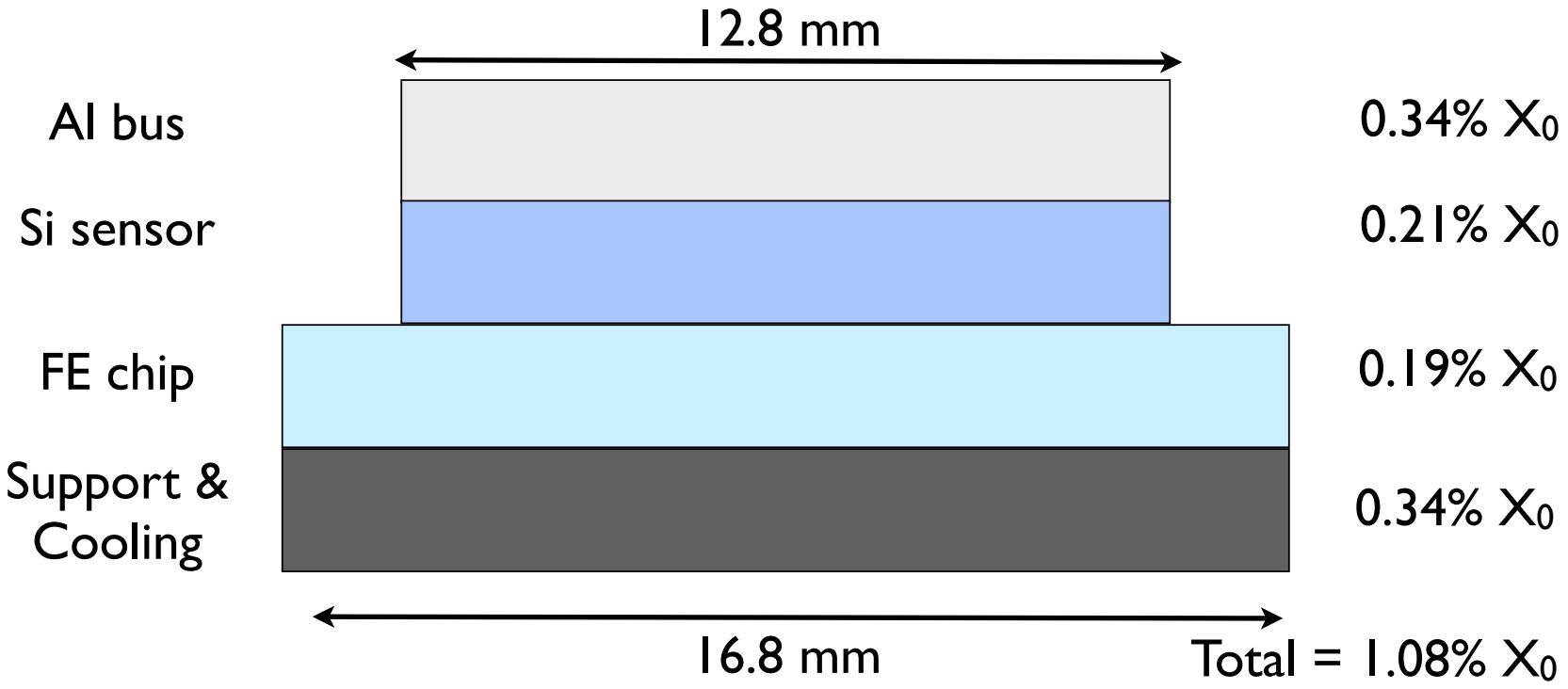


Design for MAPS solution

Mechanical design can be considered valid also for Hybrid Pixel solution though small changes could be applied when finalized design will be ready.

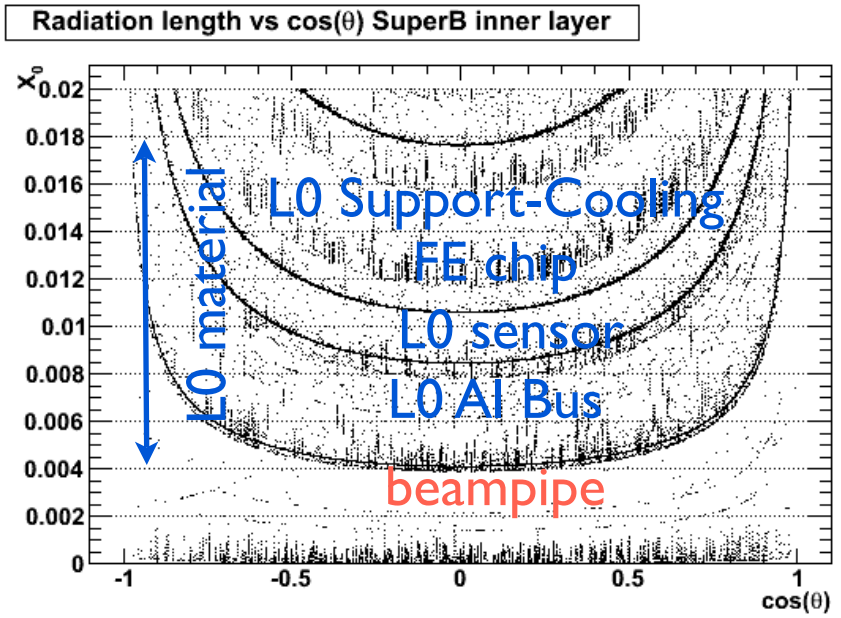
Hybrid pixel solution

- Module cross section

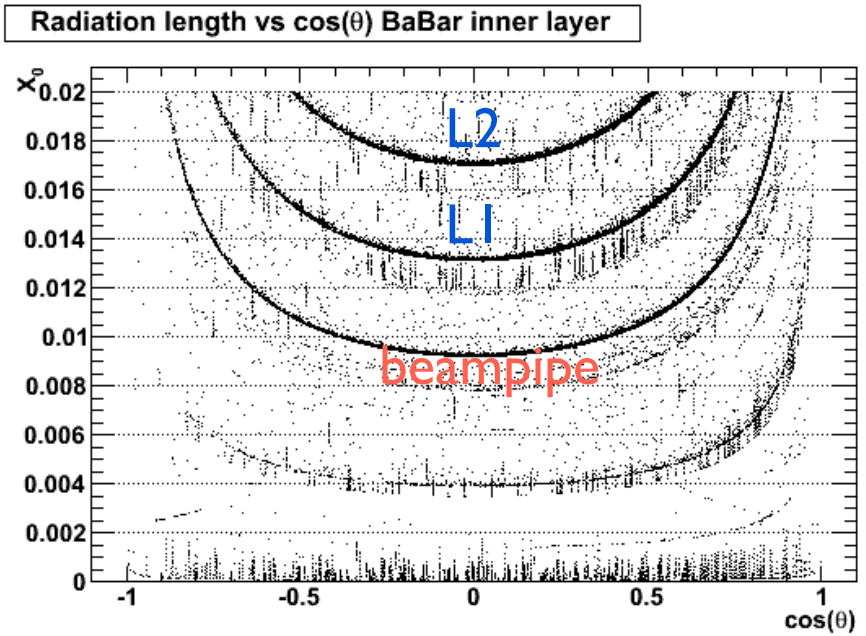


Radiation length vs cos(theta) in FastSim

SuperB



BaBar

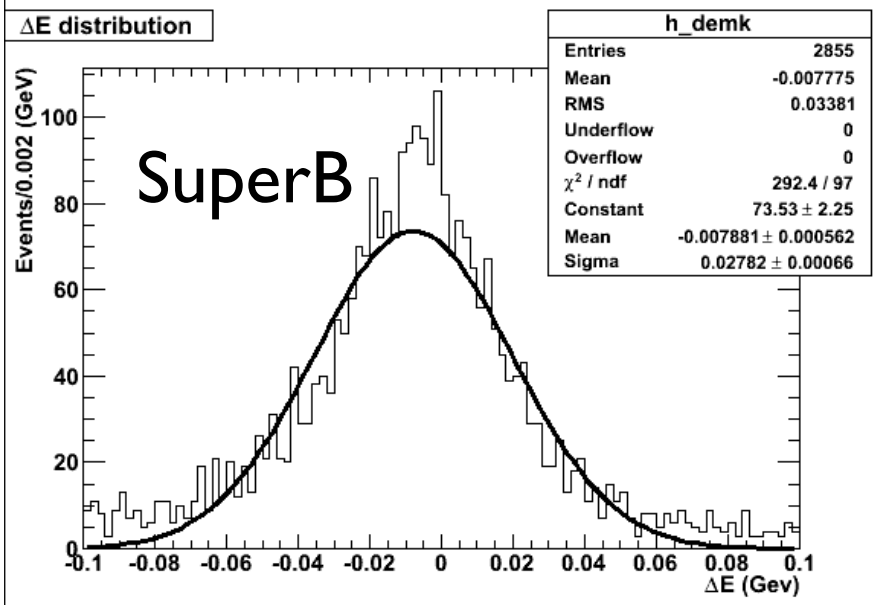


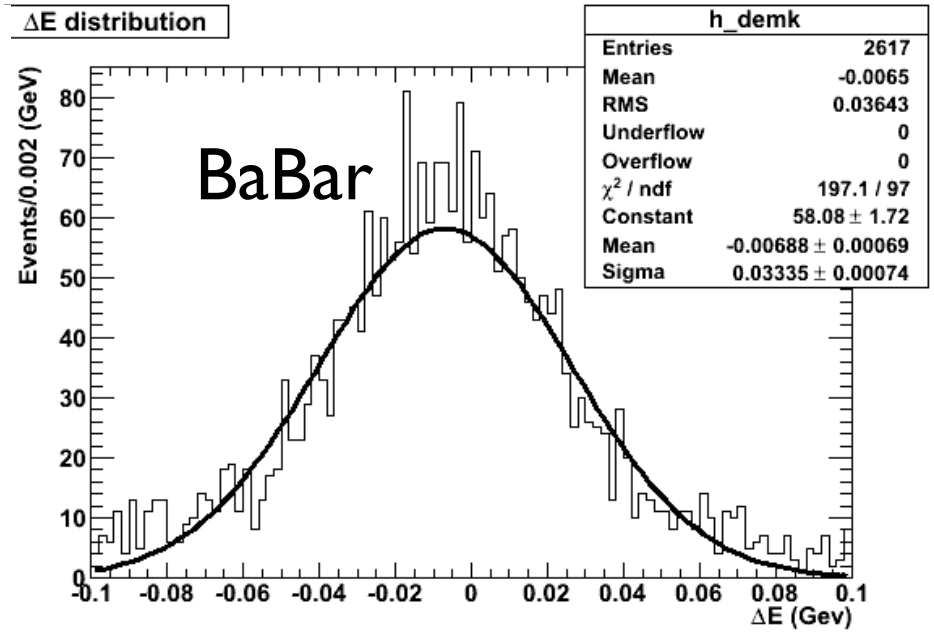
Total amount of L0 material is ~1.36% X_0 considering overlap of passive material.
Relative amount of material for Al bus and support-cooling requires small adjustments.

Vertex studies

- I used UpsilonQA package and standard BaBar Tag vertex algorithm to perform these tests.

ΔE resolution: $B^0 \to \pi^+\pi^-$



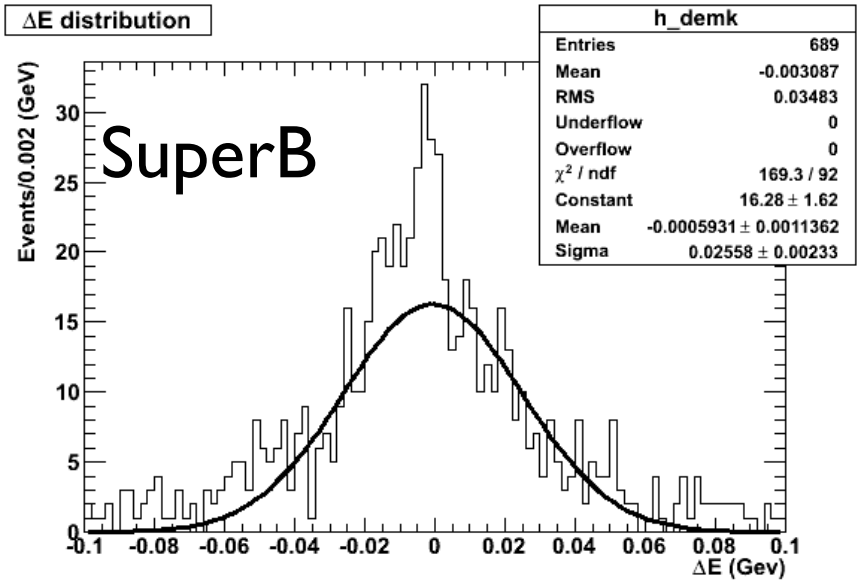


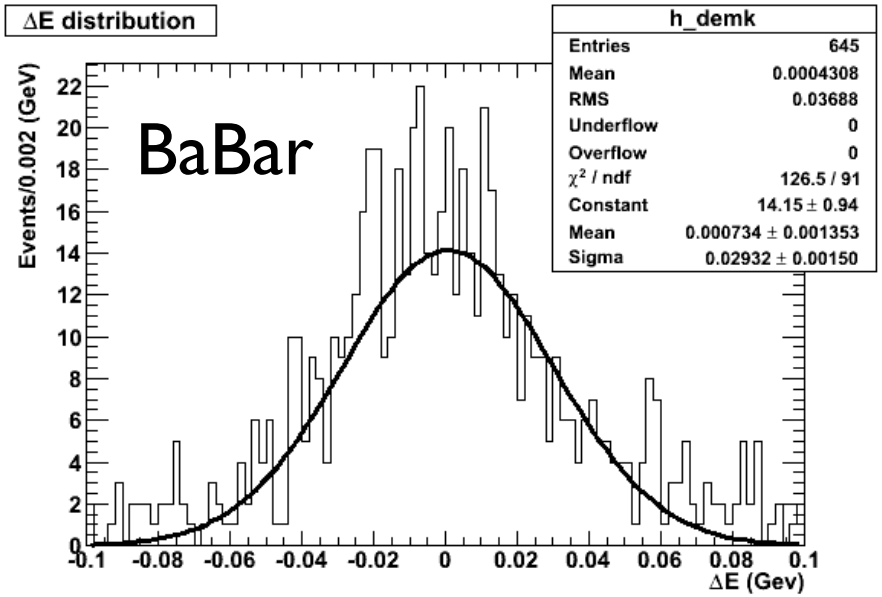
$\sigma \sim 28$ MeV

$\sigma \sim 33$ MeV

Noticeable improvement in ΔE resolution wrt BaBar.

ΔE resolution: $B^0 \to \Phi K_S$



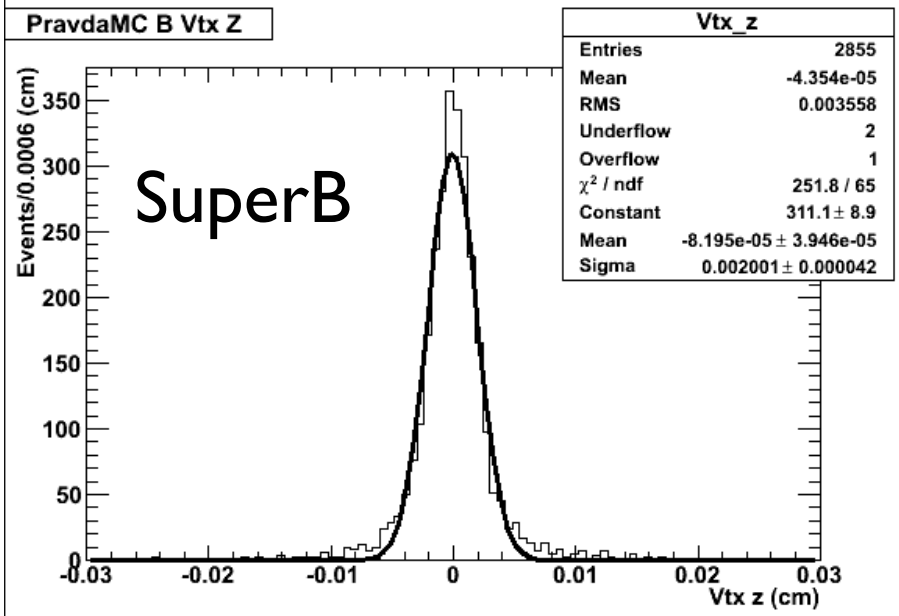


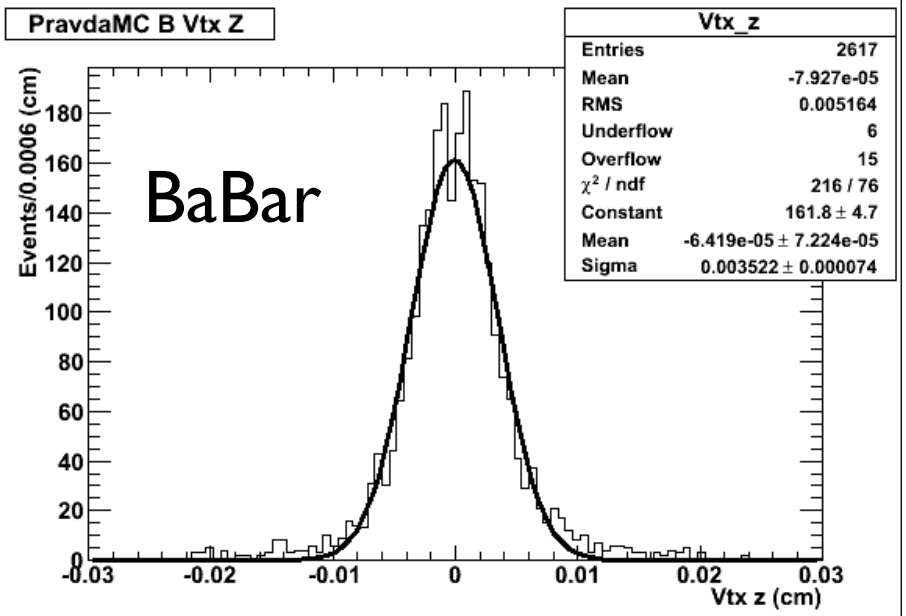
σ~26 MeV

σ~29 MeV

Reco vertex resolution:

$B^0 \to \pi^+\pi^-$





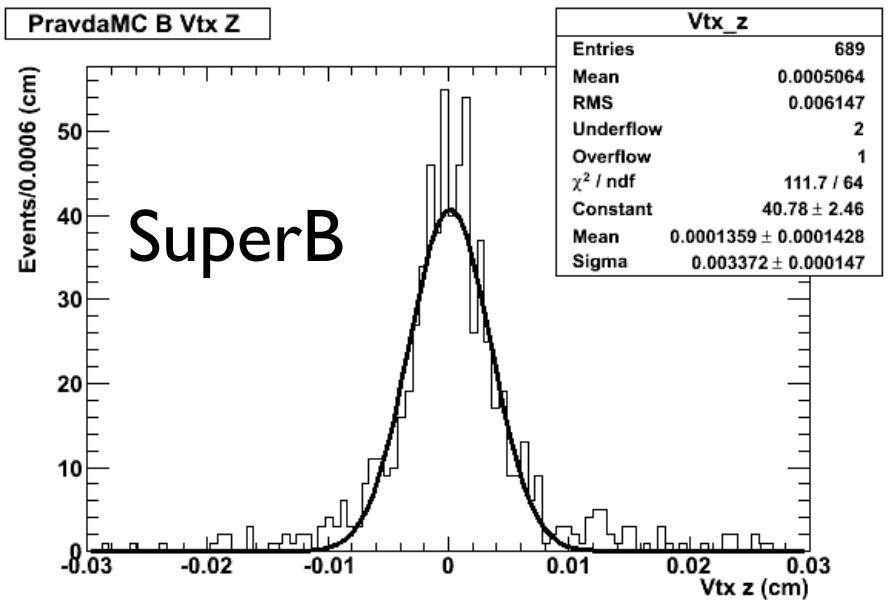
$\sigma \sim 20\mu m$

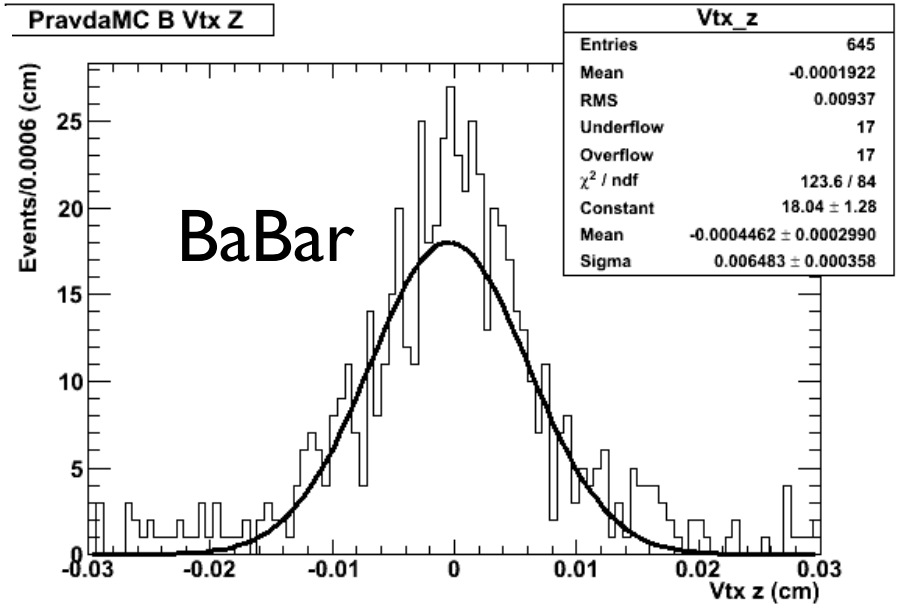
z coordinate resolution

$\sigma \sim 35\mu m$

z coordinate resolution

Reco vertex resolution: $B^0 \rightarrow \Phi K_S$

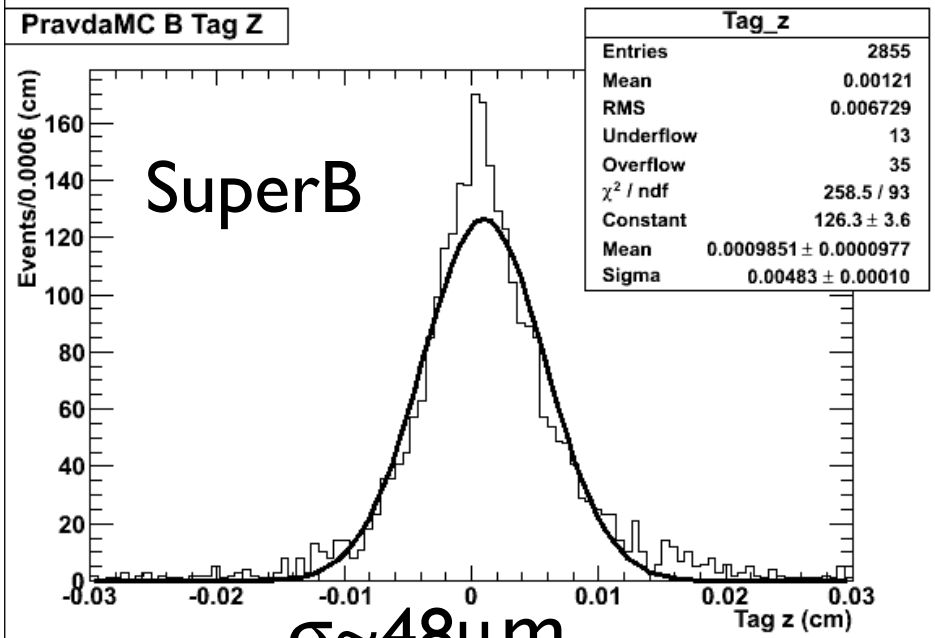




$\sigma \sim 34 \mu m$
z coordinate resolution

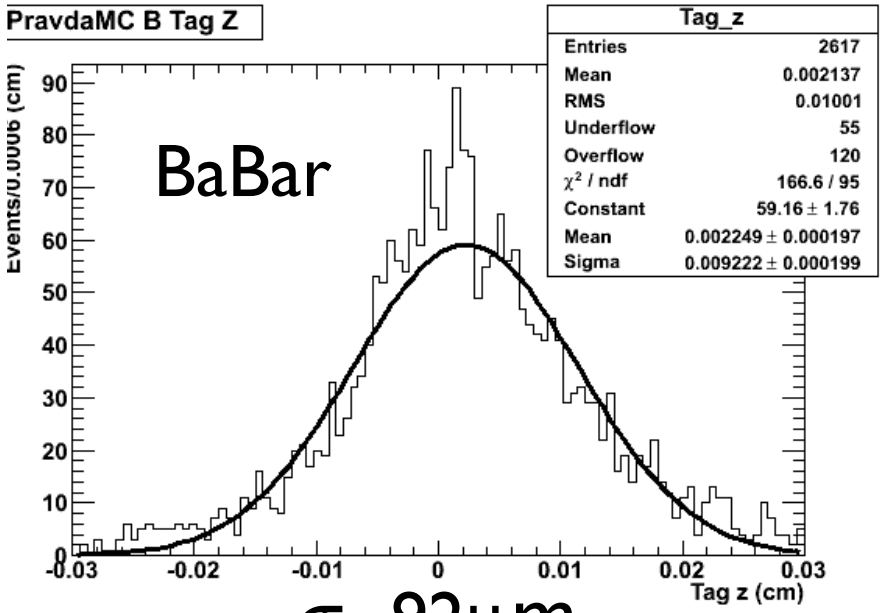
$\sigma \sim 65 \mu m$
z coordinate resolution

Tag vertex resolution



σ~48μm

z coordinate resolution

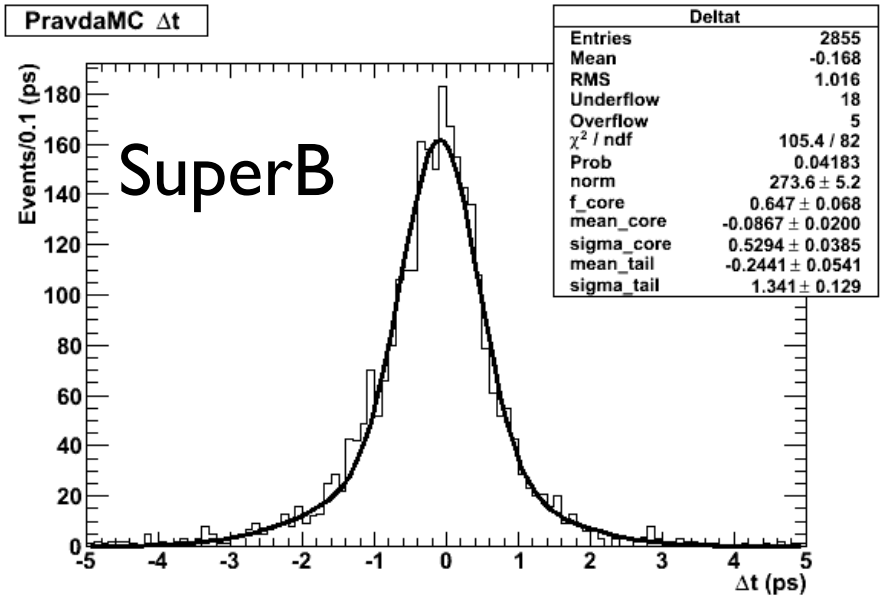


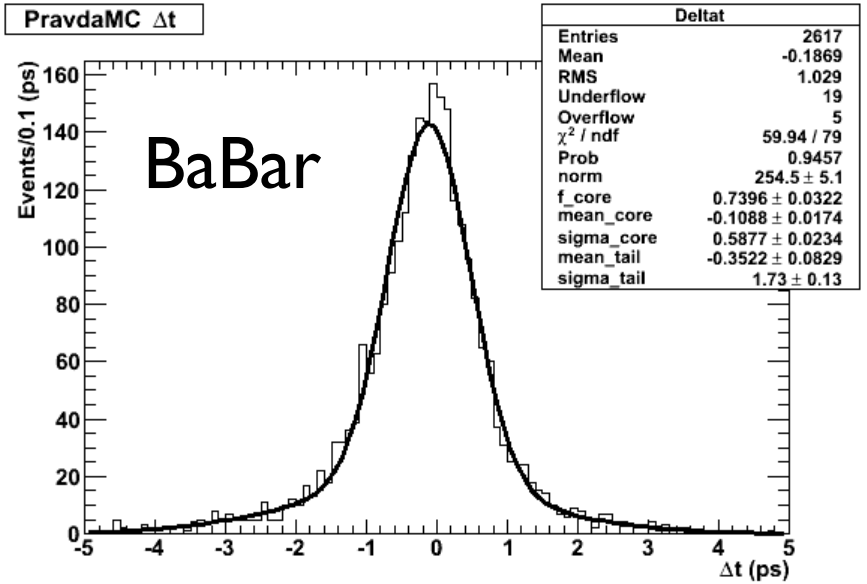
σ~92μm

z coordinate resolution

Almost a factor 2 improvement in Tag vertex resolution for y and z coordinate (z coordinate in the plot). Larger improvement in x.

Δt resolution: $B^0 \to \pi^+\pi^-$



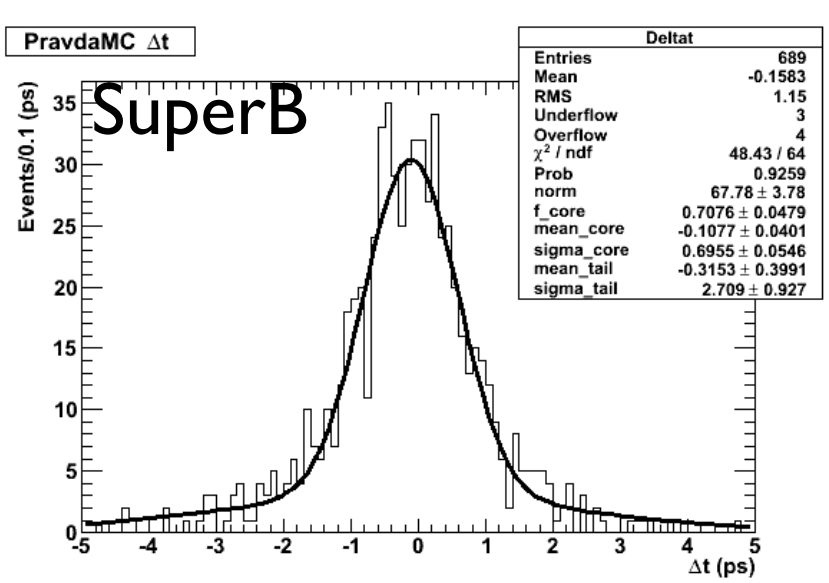


f_{core} ~0.64 σ_{core}~0.53ps
f_{tail} ~0.36 σ_{tail}~1.34ps

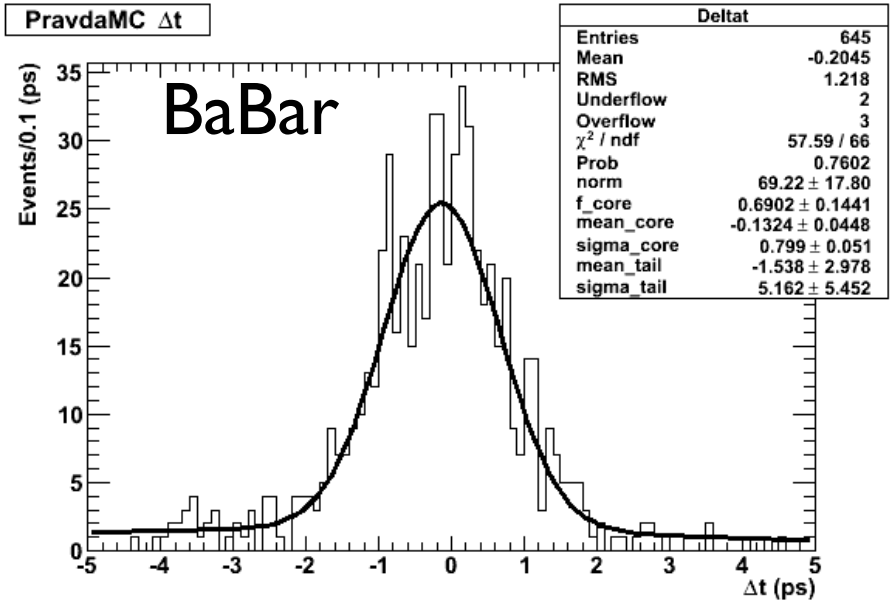
f_{core} ~0.74 σ_{core}~0.59ps
f_{tail} ~0.26 σ_{tail}~1.73ps

Proper time resolution is still comparable with BaBar one with present SVT baseline.

Δt resolution: $B^0 \to \Phi K_S$



f_{core} ~0.71 σ_{core}~0.70ps

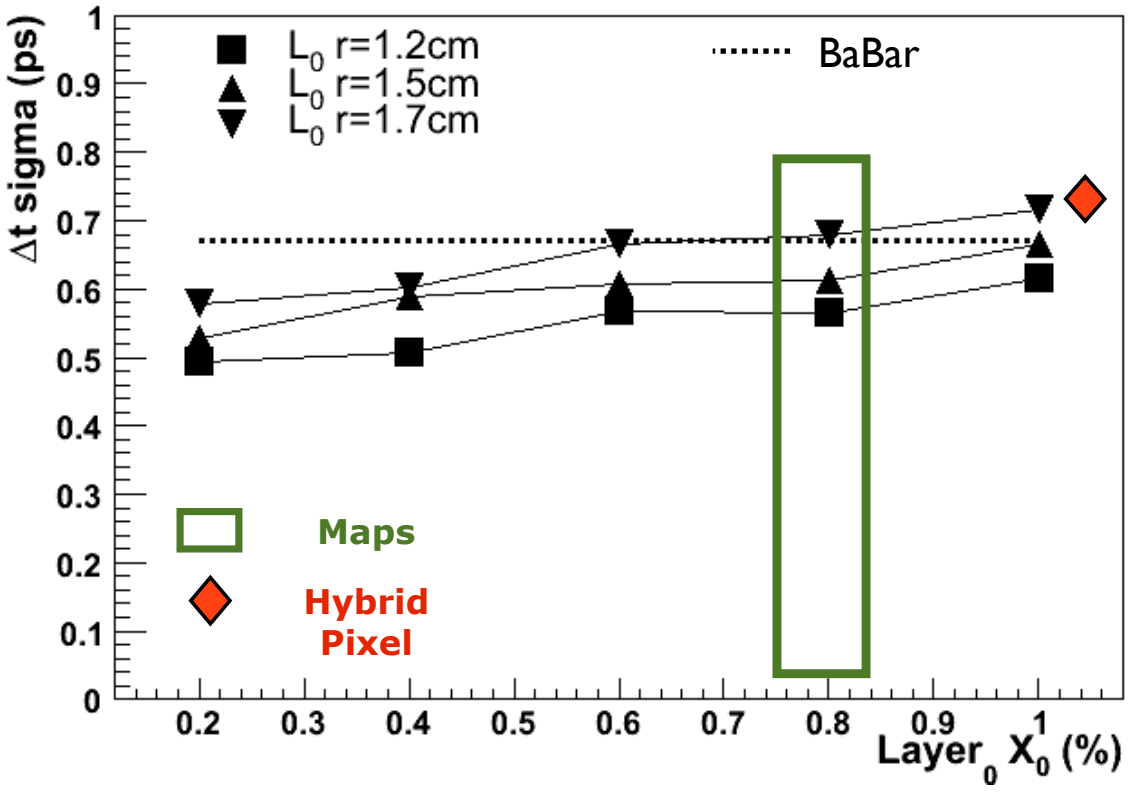


f_{core} ~0.69 σ_{core}~0.80ps

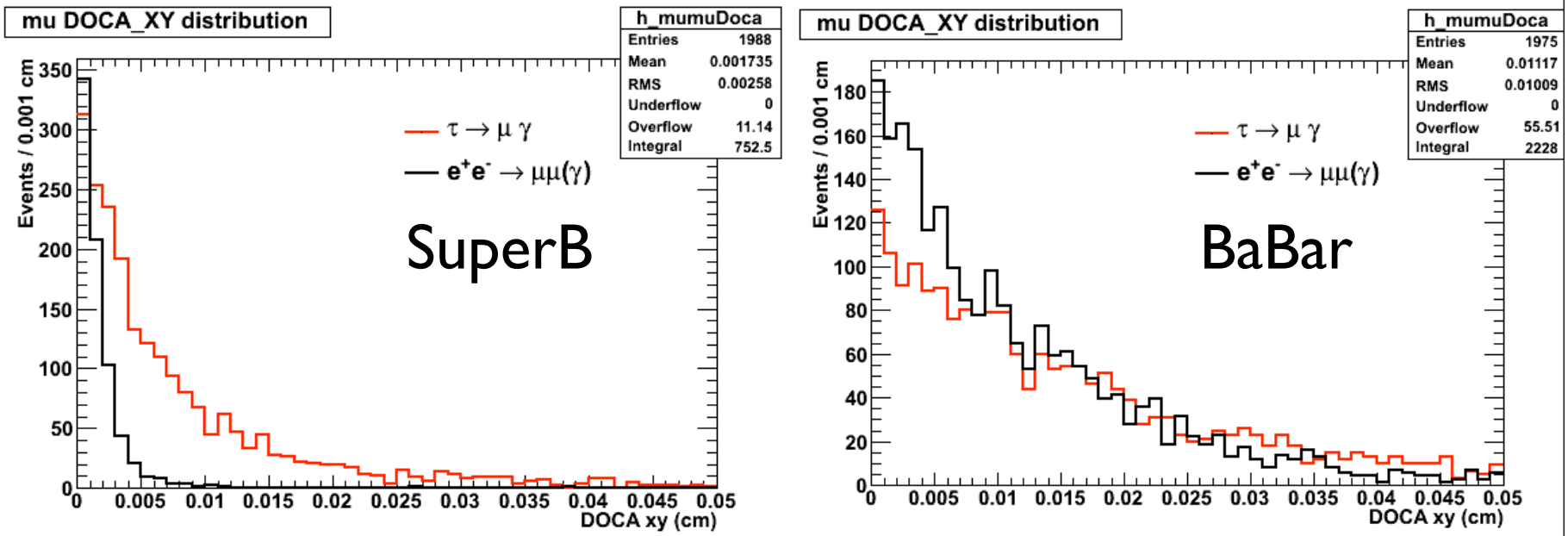
- BaBar vs SuperB proper time resolution looks comparable.
- The results I showed in Paris where produced with a different setup: BtaNtupleDumper and default tag vertex settings. I decided to use UpsilonQA this time since more info are available in the ntuple.
- I found up to 10% difference in the results for proper time resolution.
- Need further investigation to understand the differences.

Δt resolution vs L0 material

FastSim simulation: Paris setup



Doca_xy: $\tau^- \to \mu^- \gamma$ vs $e^+e^- \to \mu^+\mu^-\gamma$



Significant improvement in DOCA_xy reconstruction.

Could help in further reducing bkg for τ LFV decays?

from G. Rizzo presentation at Tech Board

Preliminary

TDR work schedule & Milestones (III)

- Detector Optimization Studies (Still need to work on a the schedule after June 2009)

Implement Baseline SVT configuration in Fastsim (realistic version): June 2009
Material, resolution model for 50 um pitch, **extend external layers to 300 mrad**, **realistic passive material in active area**.
dE/dx and realistic modeling of the material at the edge of the coverage might require more time.
Test layer 0 performance for time dependent analysis (channel phi Ks) with realistic baseline**:** June 2009
Extension of SVT max radius vs Extension of DCH min radius: June 2009
Extend geometry to 200 mrad to allow study in DGWG (Help from DGWG people)
Evaluate performance (tracking and time dependent analysis) with L0+L1 made of hybrid pixel .by Oct 2009?
External Layer radial position optimization (channel Ks pi0) : efficiency, resolution, evaluate error on asymmetry with toy MC: by Oct-Dec 2009?

bold=done
underlined=in progress

Next steps

- Implement improved resolution model for Layer0.
- Perform studies to understand pro and cons of enlarging SVT outer radius or reducing DCH inner radius, to coordinate together with DCH group:
  - track parameter resolution;
  - Ks reconstruction;
  - soft pion reconstruction;
  - other suggestions?
- Model the passive material at the edge of the active volume for the SVT baseline.