IFR Fast Simulation

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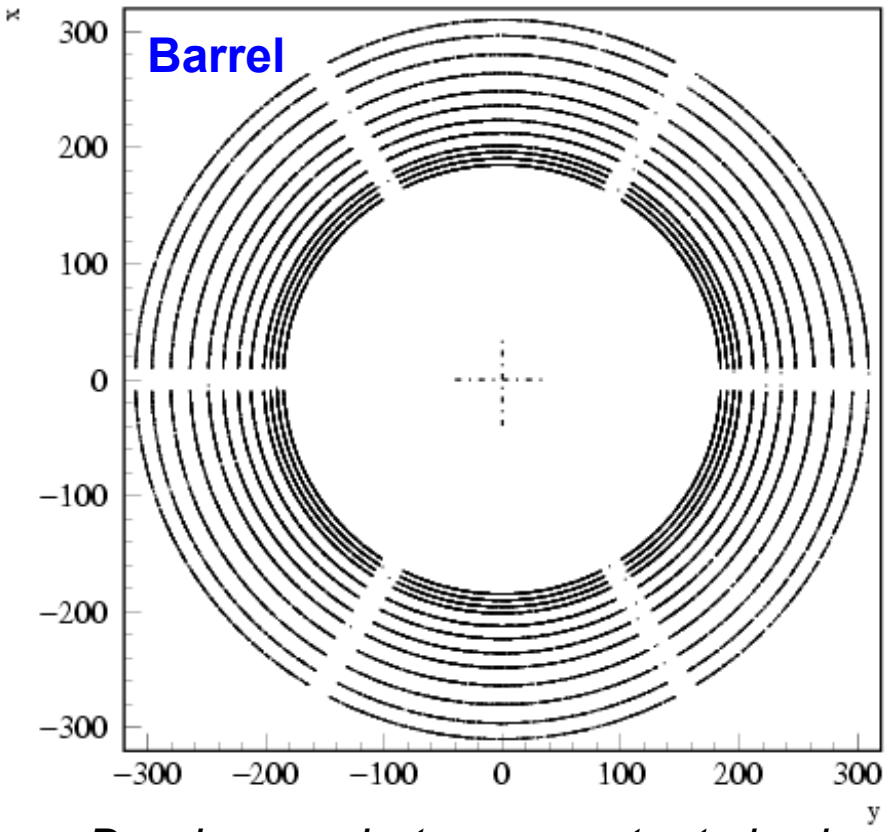
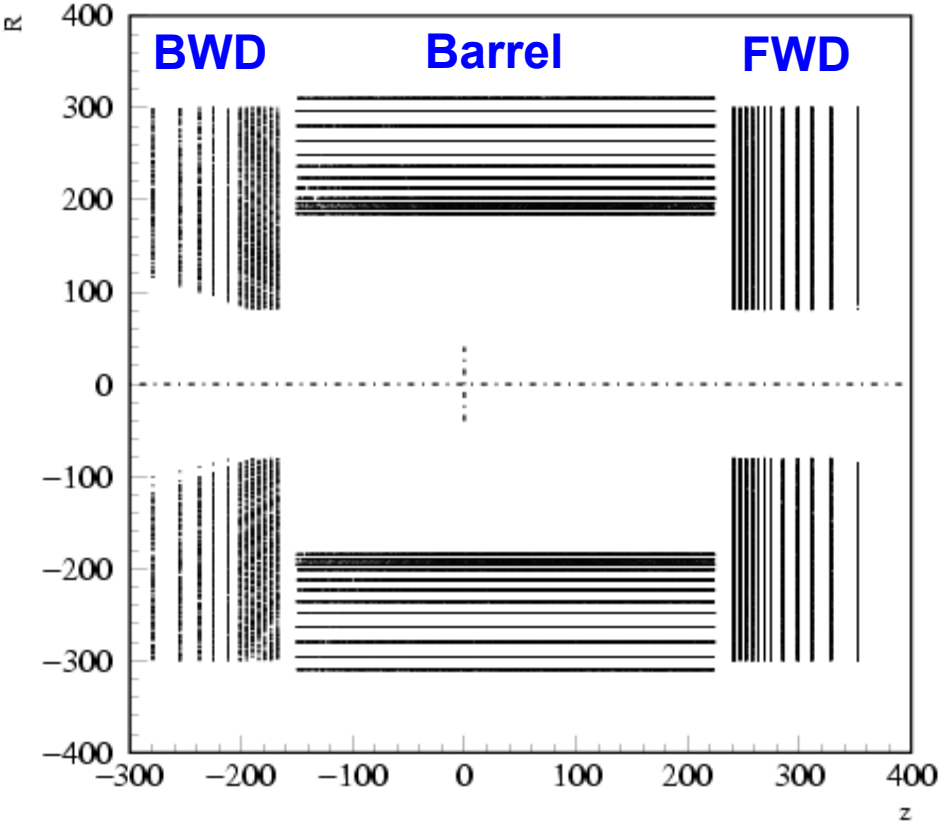
IFR Fast Simulation: Geometry

- *IFR Geometry in the V01 of the Fast Simulation*
  - *Simplified geometry: cylinders (barrel) + rings (endcaps)*

PacSimHit coordinates from a large sample of B->$\mu\mu$ events

BaBar configurations:
- 12 active layers
- absorber Iron and Brass

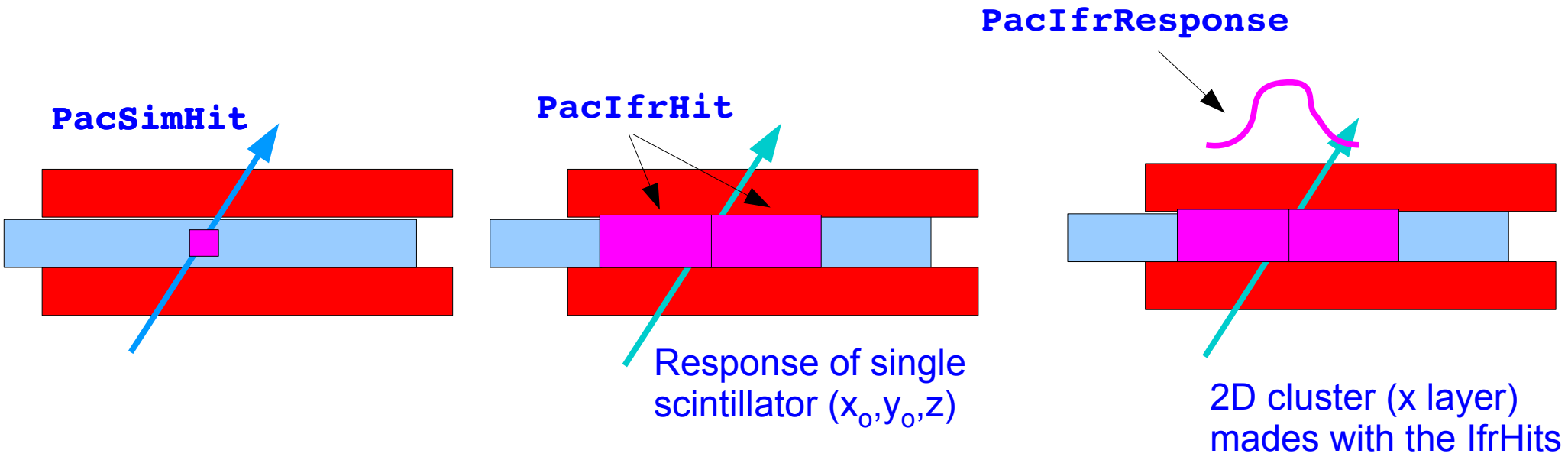




Dead space between sextants is simulated as hit inefficiency (configurable via xml configuation file)

IFR Fast Simulation: interaction

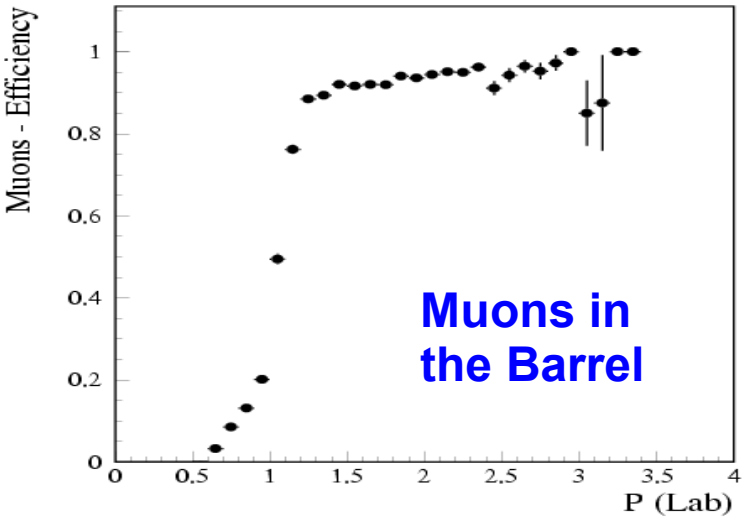
- *IFR in the V01 of the Fast Simulation*
  - *Outside the coil the magnetic field is modelled with a 0-Field*
    - *Tracks in the IFR are straight lines*
  - *Material effects computed each step through the full detector (multiple scattering, energy loss...), interaction probability for hadrons given by the interaction length*
  - *Simple reconstruction, similar to what is done in BaBar, but written from scratch*
  - *For each track/shower: a list of* `PacIfrResponse` *objectes is created*

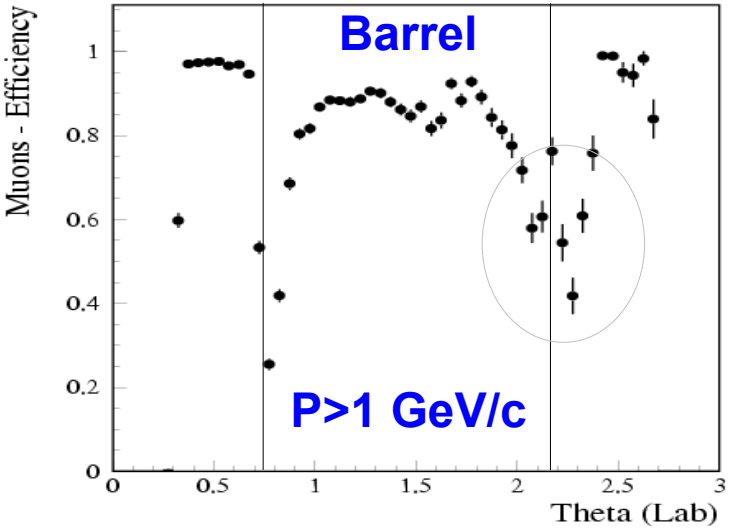


Performances

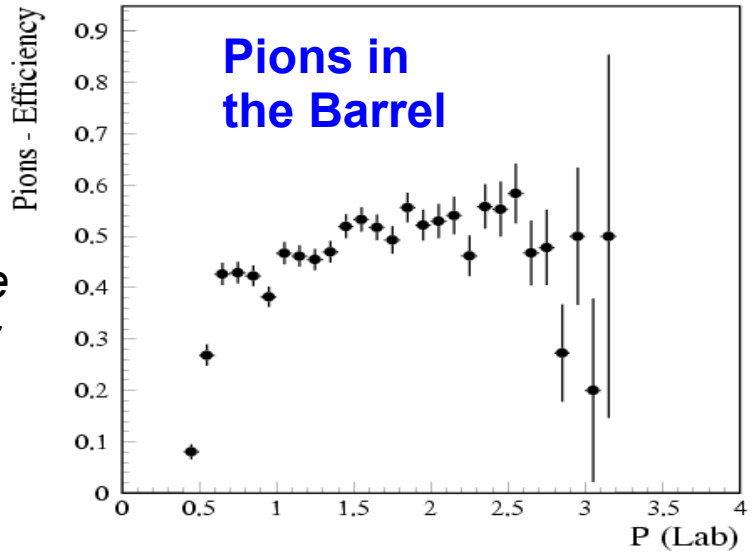
- *mu/pi separation based on the # of traversed layers in the Iron: N>9 Layers*

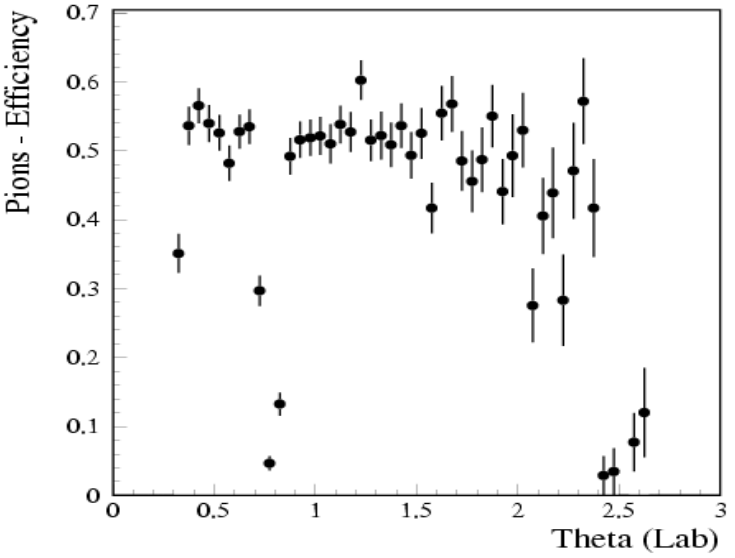
Muon efficiency too optimistic, but the general features (shape of the efficiency versus theta and p) are in reasonable good agreement with the expectation





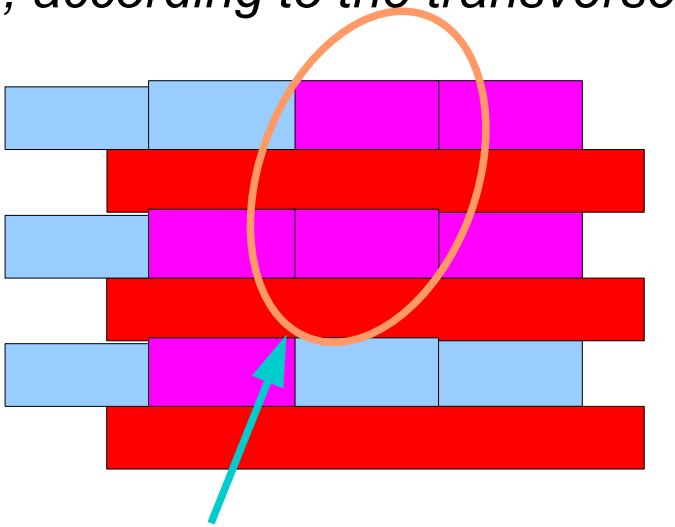
Pions efficiency is too high!
We need to better simulate the IfrResponse when a hadronic shower is produced





Hadronic Showers

- *When a hadron showers, PacSimHits are created within the IFR, with shower informations available (David Brown talk):*
  - *Longitudinal development is parameterized (actual range is properly fluctuated)*
  - *For now, we do not take any other action for hadronic showers!*
- *Priority: better simulate the detector response to hadron showers and optimize the shower parameters in segmented environment*
  - *A relevant aspect is the lateral development: some measurements (for E>10GeV) are available (Barreiro et al. DESY 89-171, 1989). At first guess could it be assumed proportional to the released energy?*
  - *Generate (fluctuate) mutiple PacIfrHit per layer, according to the transverse development*
  - *This will affect*
    - *the average size of the 2D cluster*
    - *the chi2 of the fit to the IFR tracks*



Next PacSim version

- *Properly fill the IfrQual object with all the relevant quantity*
  - *Up to now only the number of penetrated layers is filled*
- *IFR response to hadronic showers*
  - *Optimize the shower developemtn parameters*
- *Perform a fit to the 2D clusters with a straight line*
  - *Evaluate the matching between the fitted helix of the track and the track in the IFR, at the coil*
  - *Fitter chi2 and the matching are crucial to properly discriminate between muons and pions*
- *Start to look at the K_L*
- *Move to the SuperB design*

IFR geometry for the Super B

- *A first SuperB IFR configuration is available in PacSim*
- *According to CDR:*
  - *Reduced number of active layers to 8*
  - *More # of Interaction lenghts (6.5-7.5 instead of 5-6 we have now in BaBar)*
  - *We added more Iron (no brass)*

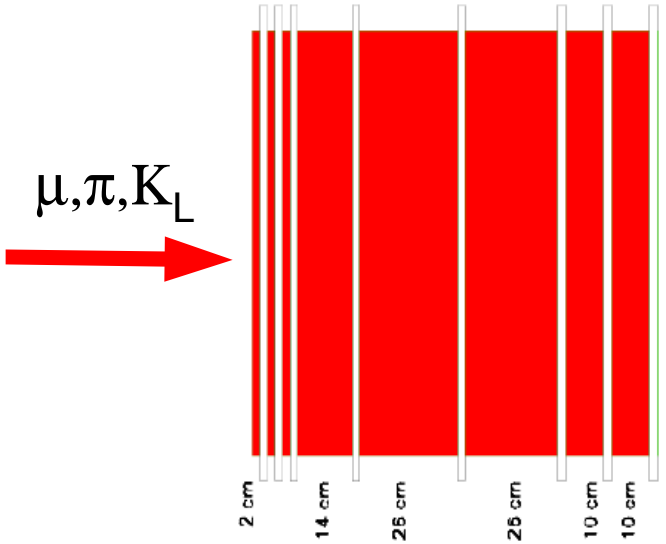
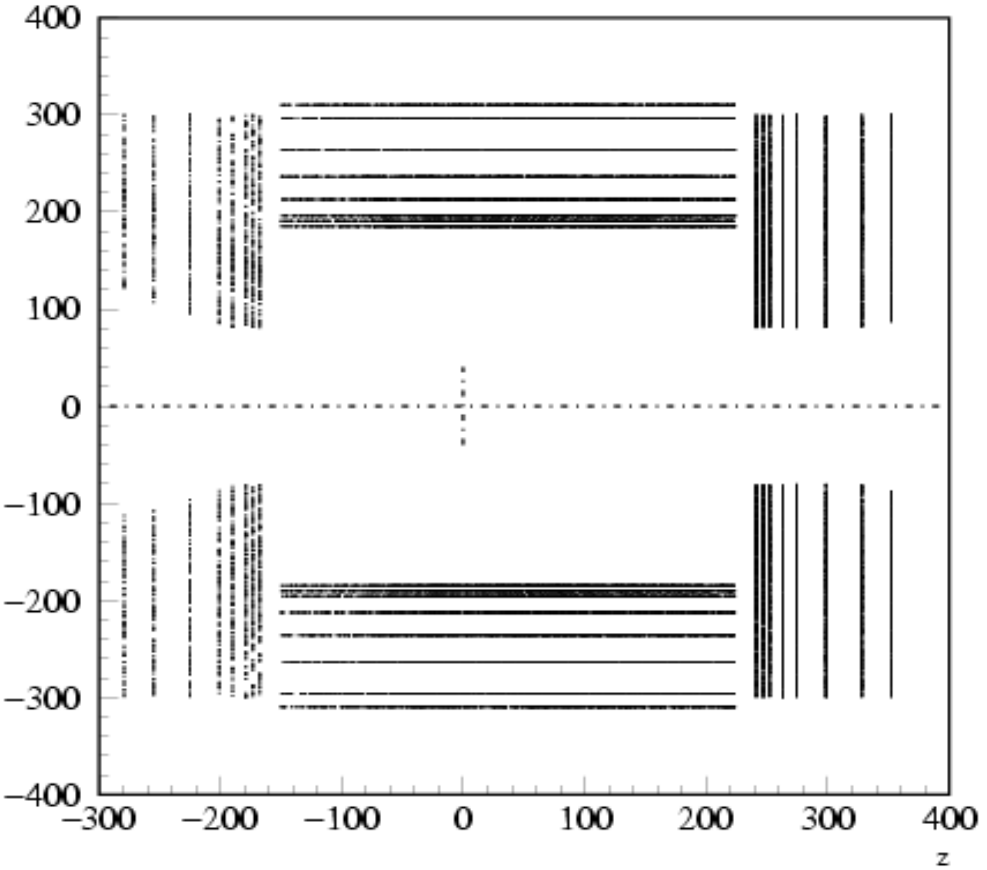


Figure 4-41. *Sketch of the longitudinal segmentation of the iron absorber (gray). Active detector positions are shown in white from the innermost (left) to the outermost (right) layers*

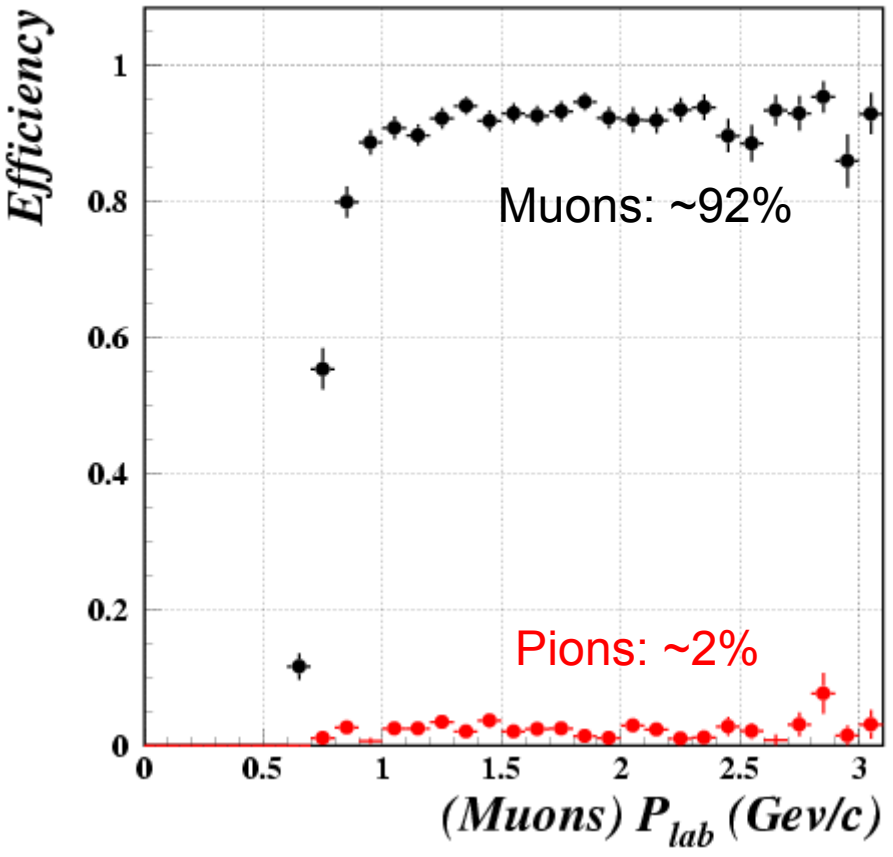


BACKUP

IFR Fast Simulation: Version 0

- *mu/pi separation based on the # of hit layers*
  - *If a hadron interact, it is stopped: no had. shower*
  - *Muon efficiency too optimistic, but the general features (shape of the efficiency versus theta and p) are in reasonable agreement with BaBar*

(0.2<theta<2.0)



Plab>0.6 GeV/c