Performance Measures

The basics...

- Momentum resolution
  - High-momentum limit
  - Low-momentum limit
- Track reconstruction efficiency
  - Prompt tracks
  - Tracks originating outside
- Production of secondaries
  - Tracking confusion
  - PFA confusion

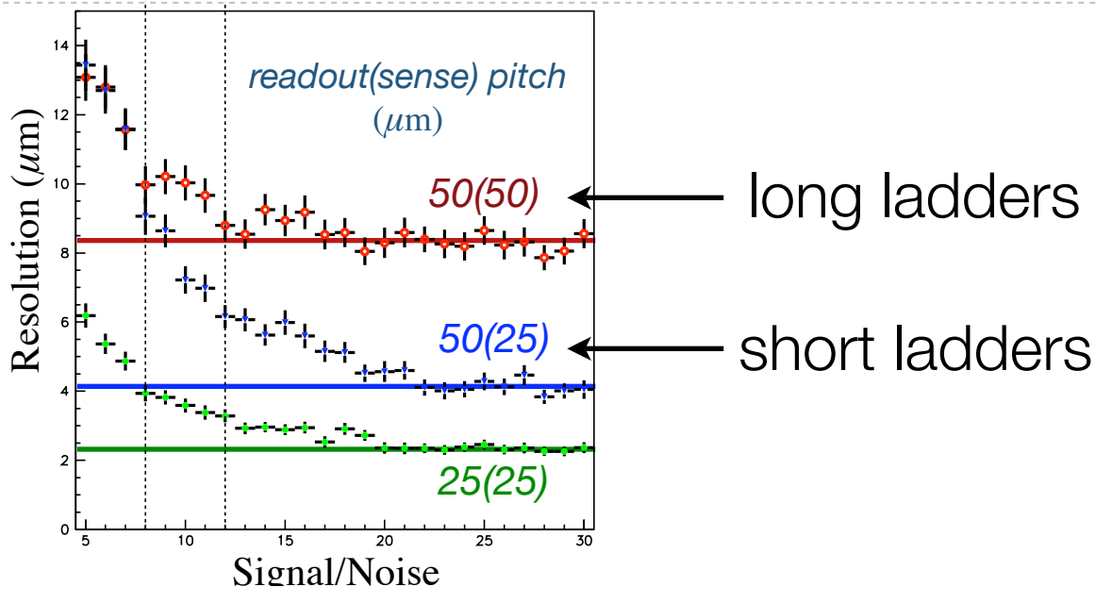
http://home.fnal.gov/~marcel/Tracking_review.doc

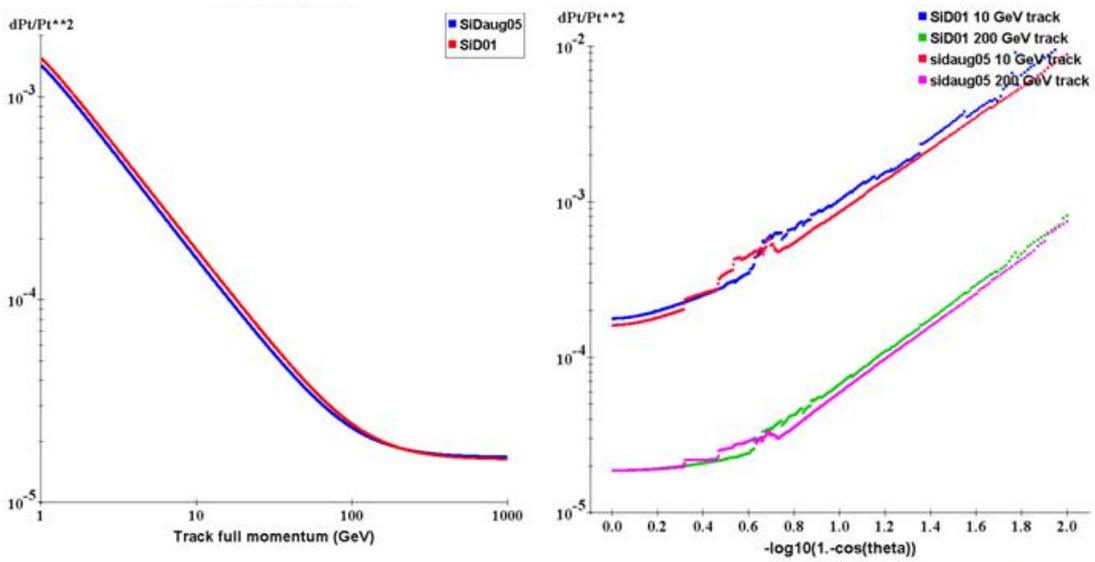
Performance Measures

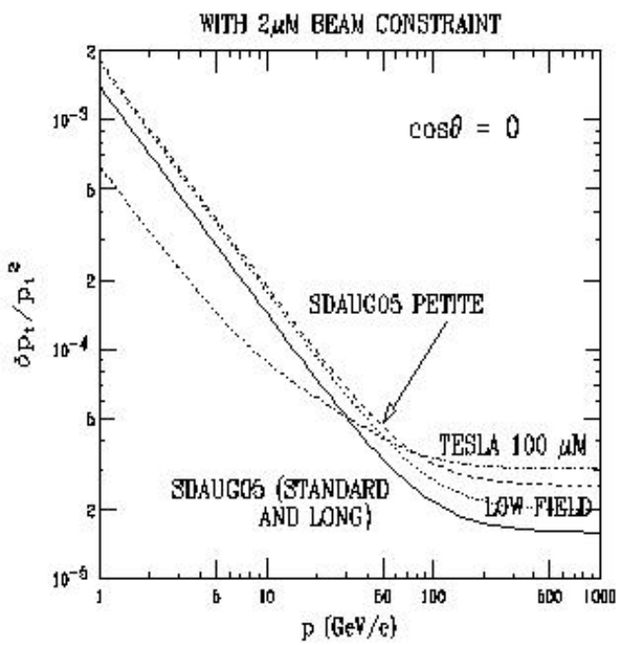
- Billoir-based calculator (LCDTRK- UCSC)
  - high-momentum: single-hit precision
  - low-momentum: material

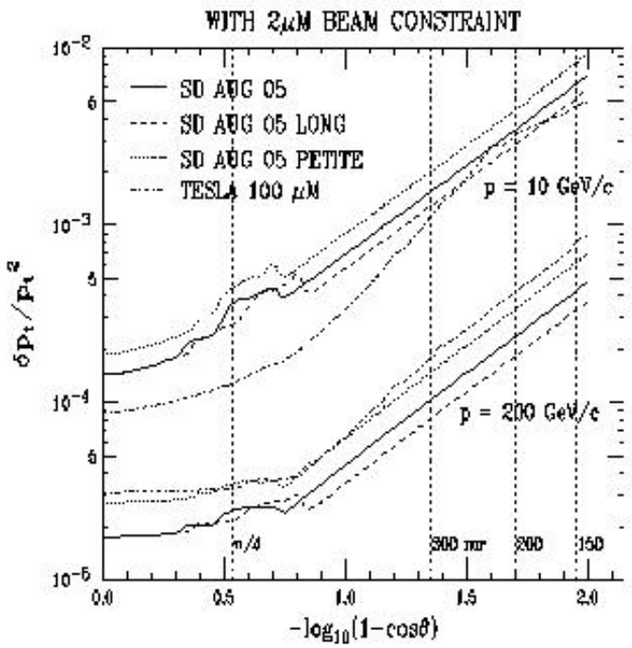
$$\frac{\delta p_t}{p_t^2} = a \oplus \frac{b}{p_t \sin\theta}$$

  - used for “fast MC” physics studies
- Full GEANT MC (weight matrix fitter)



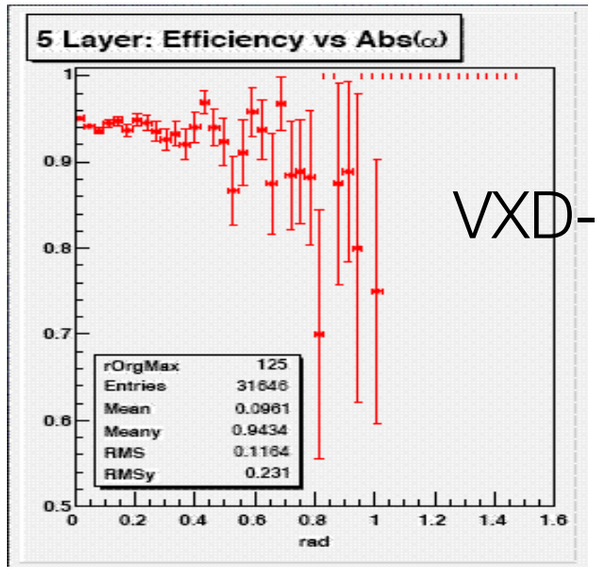


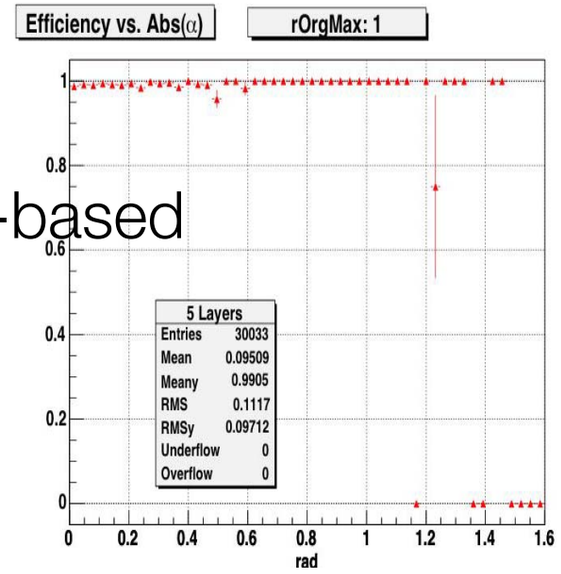




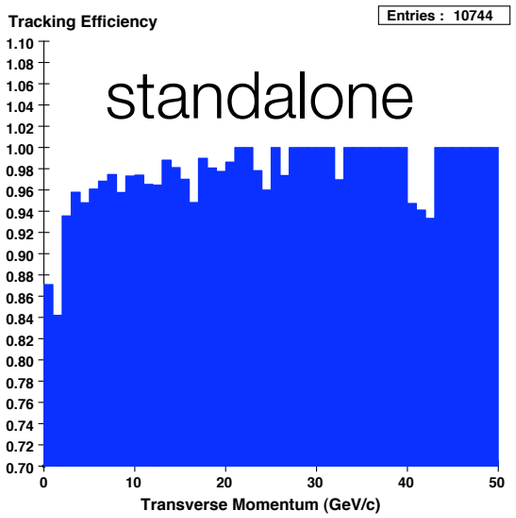
Efficiency

- VXD-seeded tracking:
  - 95% of all tracks
  - 99% of prompt tracks
  - Very pure in central, less in forward
- Outer-tracker standalone
  - 99% of prompt tracks
  - 50% non-prompt, highly pure
  - 25% non-prompt, less-pure
- Calorimeter-seeded tracking
  - 90% of non-prompt tracks with 3-hits in tracker
- Room for improvement, combination
- studying z-segmentation, tools becoming available for strip simulation

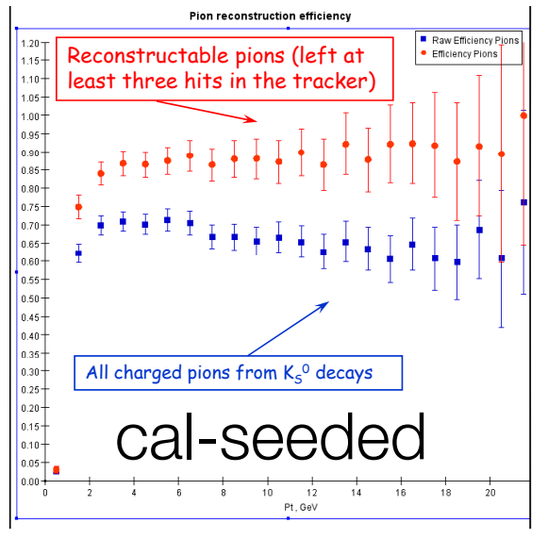




VXD-based



standalone



cal-seeded

Optimizations

- momentum resolution
  - relatively easy to optimize: pitch, S/N, material
  - more difficult to define (and agree upon) the exact requirements

- efficiency
  - much more difficult:
    - z-segmentation (starting)
    - stereo? (becoming possible)
    - material
    - # layers
    - S/N
    - backgrounds
    - VXD readout scheme
    - and many, many, more...

Comparisons

- For high-pt, silicon cannot be beat
- At low-pt, goal is to make silicon comparably thin to TPC
- Efficiency is key. Very difficult to compare
  - No common framework for TPC, All-silicon reconstruction
  - Very different algorithms
  - Very different susceptibility to backgrounds and other subdetectors