# LEP Tracking Status

Steve Aplin


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- Break LEP tracking out of Brahms and reuse it within a MARLIN Processor
- LEPTracking provides the following:
- Track finding
- Track fitting
- Ambiguity resolver
- Full matching between subsystems

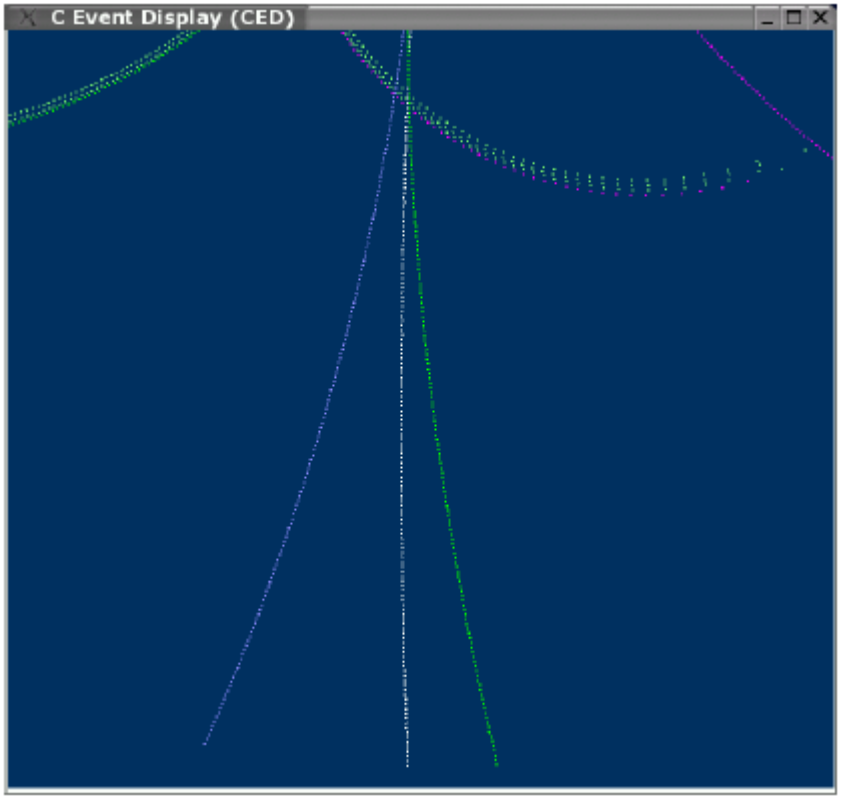
- A C++ Class is defined that describes an STL vector of structures which mimic the ZEBRA banks
- The Class also provides gets() and sets() to access the data
- In F77 statement functions are used to call C++ functions
- cfortan.h is used to facilitate these calls in a machine independent way

- Geometry is defined in GEAR

```
- <detector id="0" name="TPCTest" geartype="TPCParameters" typ
    <maxDriftLength value="2500."/>
    <driftVelocity value=""/>
    <readoutFrequency value="10"/>
    <PadRowLayout2D type="FixedPadSizeDiskLayout" rMin="386.0"
    maxRow="200" padGap="0.0"/>
    <parameter name="tpcRPhiResMax" type="double"> 0.16 </para
    <parameter name="tpcZRes" type="double"> 1.0 </parameter>
    <parameter name="tpcPixRP" type="double"> 1.0 </parameter>
    <parameter name="tpcPixZ" type="double"> 1.4 </parameter>
    <parameter name="tpcIonPotential" type="double"> 0.00000003
  </detector>
```

- TPCDigiProcessor provides Gaussian smearing according to the specified rphi and z resolutions
- Hits which would produce merged readout signals are flagged
- This follows a geometric approach
- At present these hits are removed from the sample
- We need to reconsider Hit production in simulation for non radial tracks

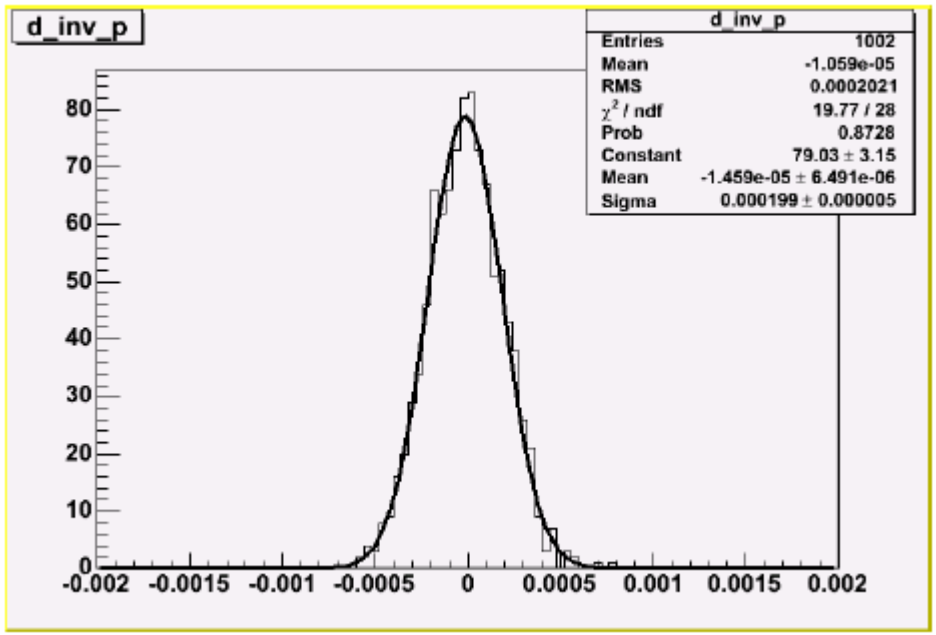
- TPC Pat-Rec modified ALEPH code
- Hits sorted by radius and phi
- Chains created from Out -> In
- Search stops at half TPC radius
- Circle Fit used to fit chains, taking multiple scattering within the TPC gas into account
- Chains are then moved in picking up hits towards the inside of the TPC

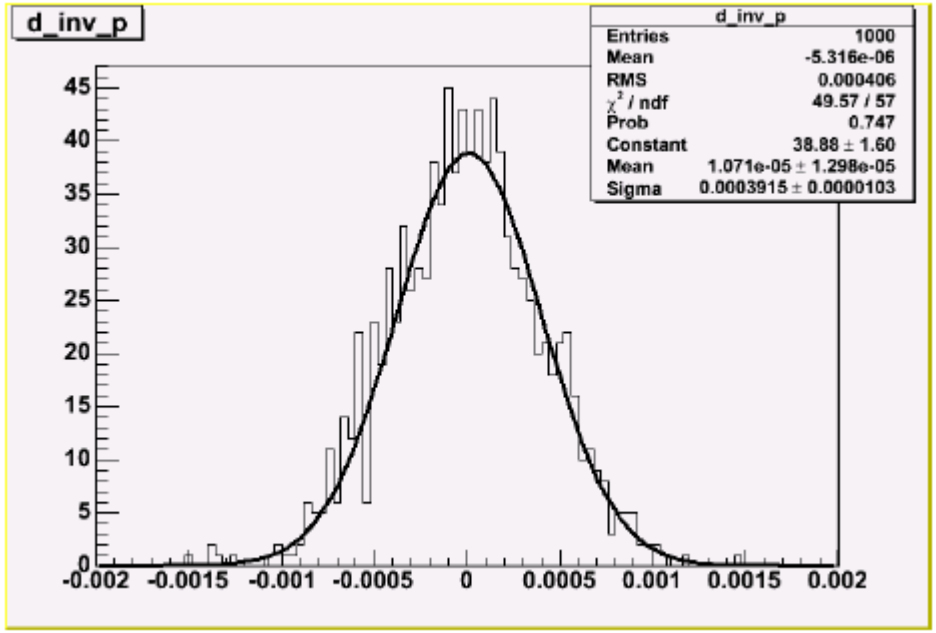


- Chains which survive are passed to a Kalman filter for final fitting
- Kalman Filter developed for DELPHI
- Fast recursive algorithm implemented using the weight matrix formalism
- Taylor expansion around a reference trajectory, provided by Circle fit, is used as a starting point to obtain a linear system
- Takes into account multiple scattering and energy loss in the material described as a sequence of surfaces
- Outlier logic, able to remove measurements depending on a $X^2$ probability cut

- Helix Hypothesis as in LCIO
  - Ω - curvature signed with charge
  - d0 - distance of closest approach signed
  - z0 - z co-ordinate of point of closest approach
  - φ - azimuthal angle of the momentum
  - tan λ - slope in the Sz plane dz/dS

# TPC Only



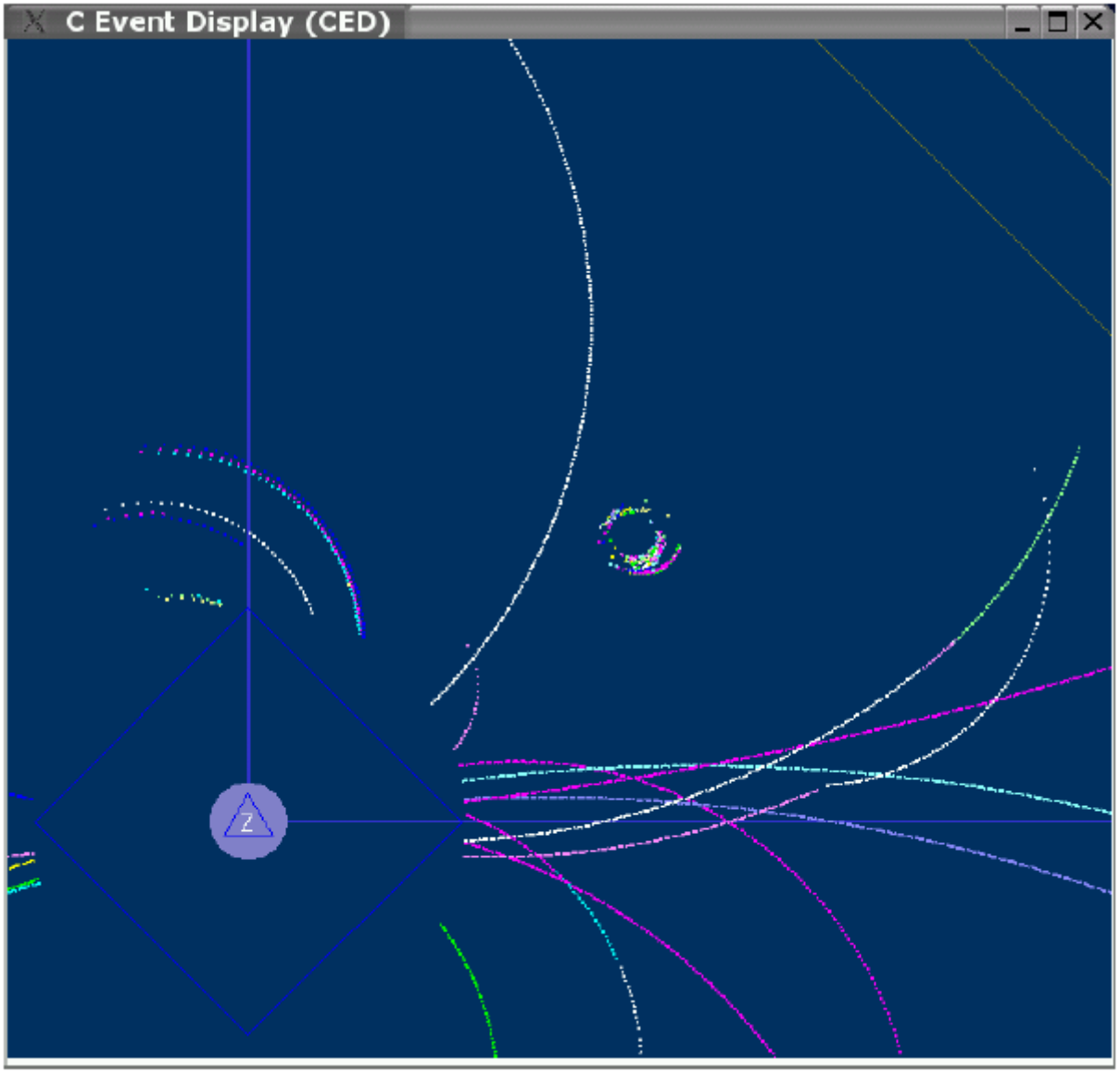

$d(1/p) \sim 2 \times 10^{-4}$

TPC $R_{outer}$ = 169cm , 200 pad rows

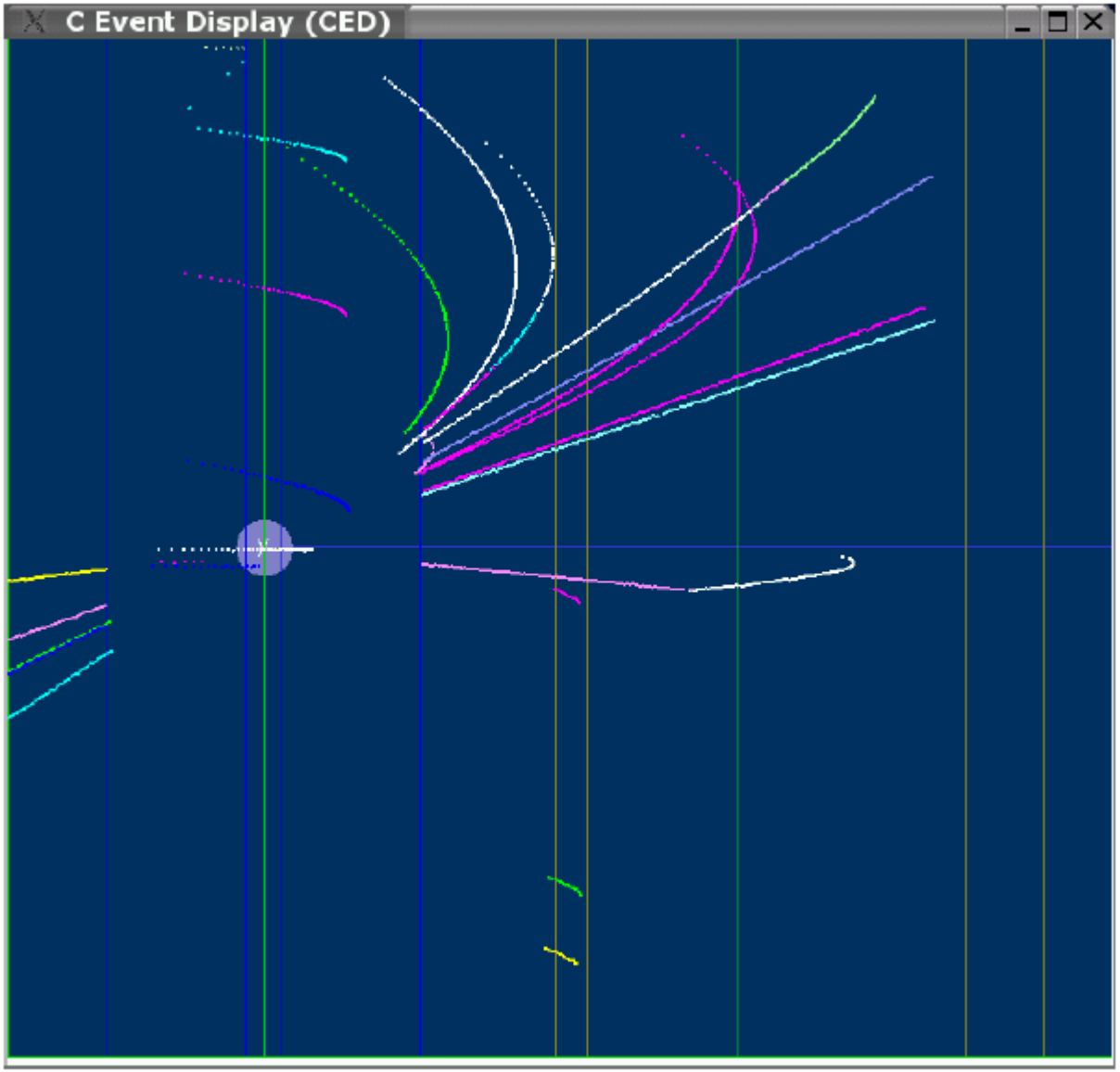
$d(1/p) \sim 4 \times 10^{-4}$

TPC $R_{outer}$ = 131cm , 150 pad rows

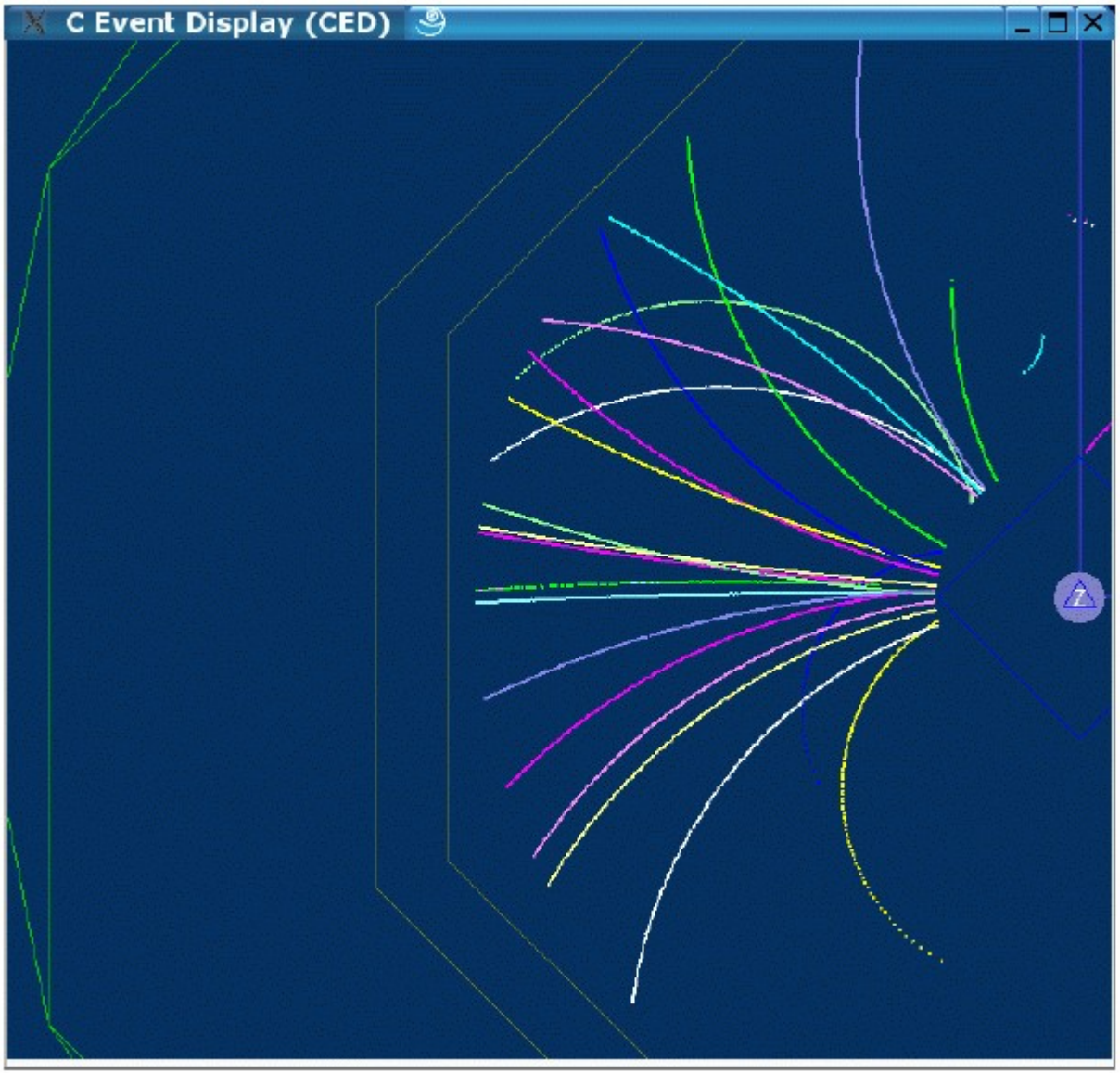
- Kink finding is not yet included



- Kink finding is not yet included



- Also problems exist with splitting of perfectly good tracks



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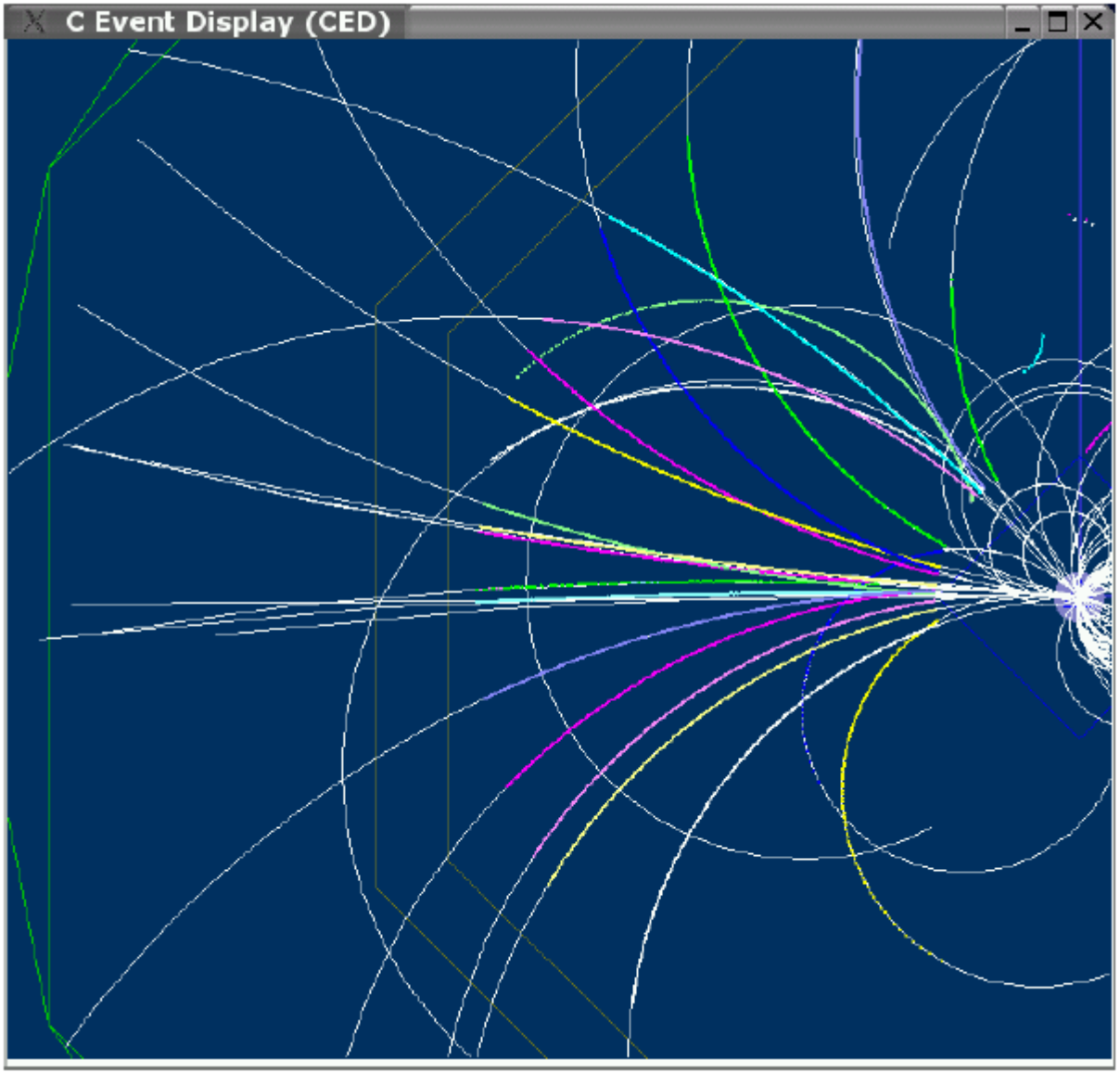
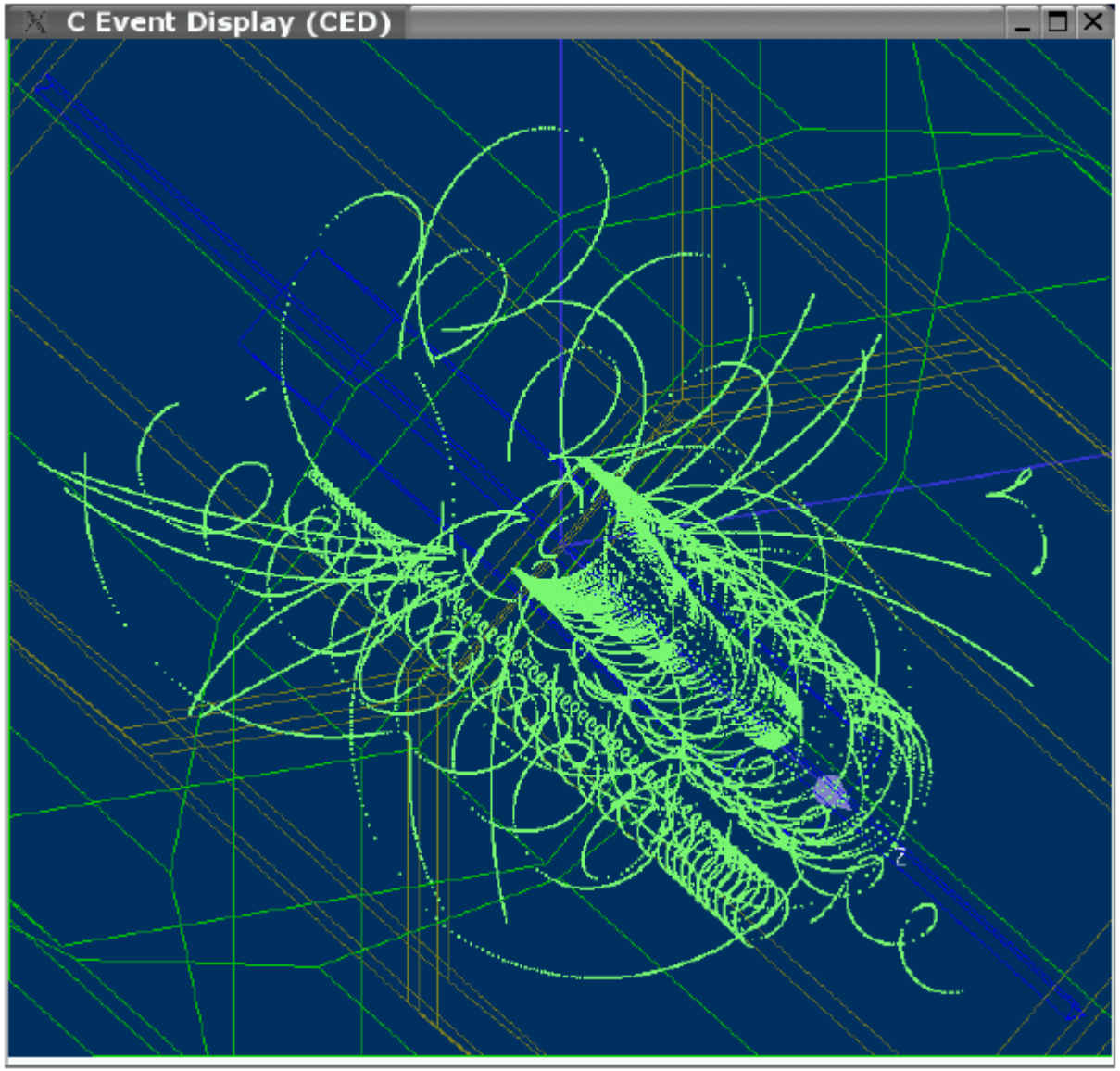
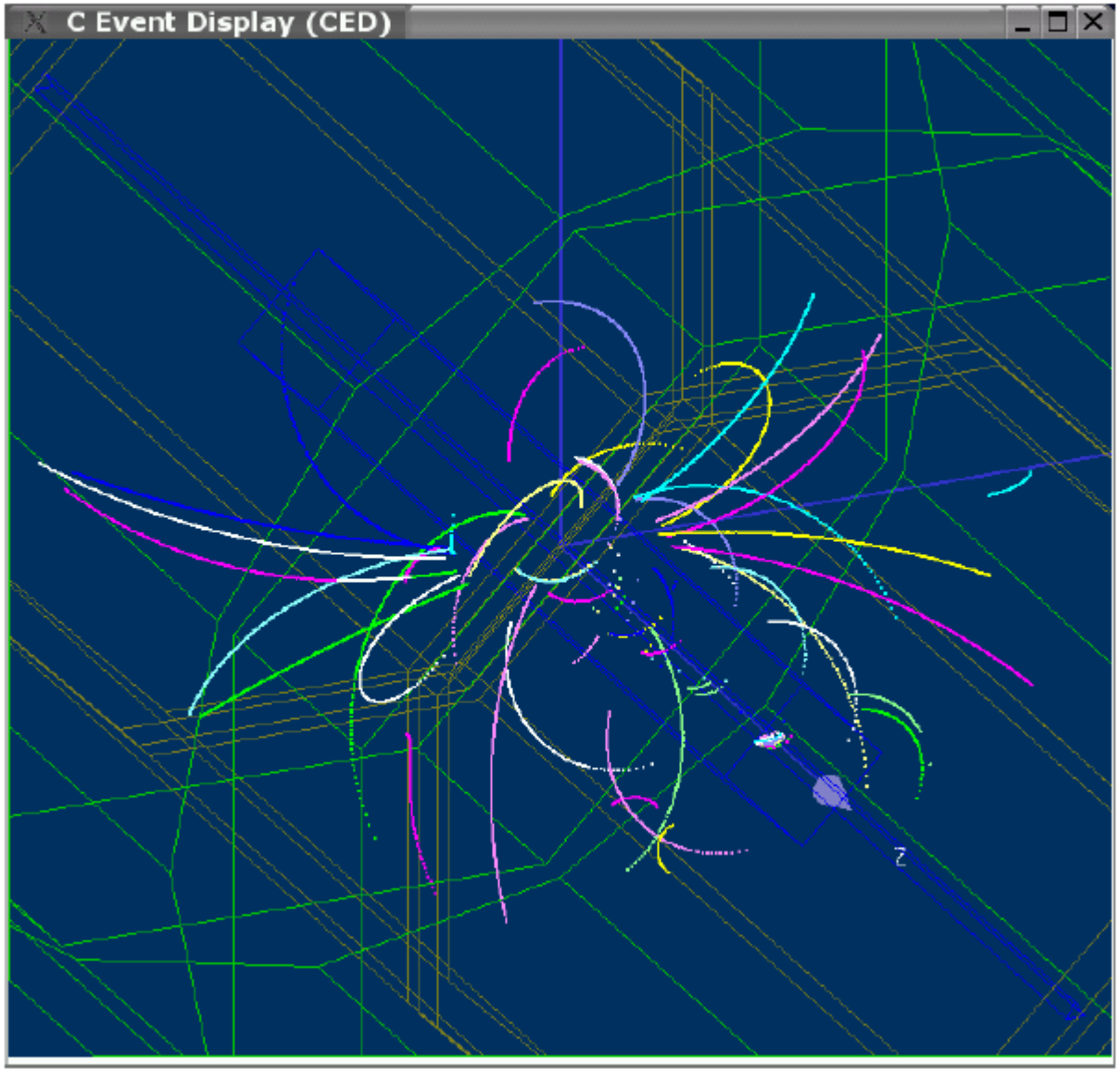


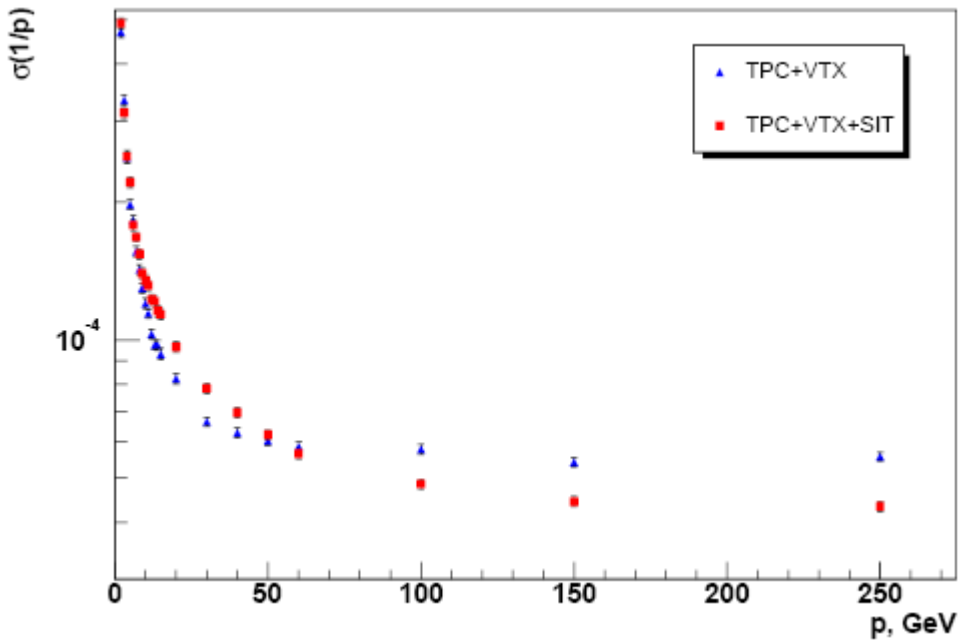
- Low energy curlers produce major headaches



- Low energy curlers produce major headaches
- New Marlin Processor “CurlKiller” produces 2D histogram and makes a cut on peaks



- No Pattern Recognition for VTX and SIT
- All hits given as individual Track Element with cov. matrix
- These are then included during track matching and fitting




Single Muons

# Summary

- Full tracking in the central region
- CurlKiller makes it stable on ttbar 500GeV
- Material description is still hard coded
- Efficiency studies need to be done soon, initial studies show > 93%, although track splitting still remains a problem
- Physics impact of low energy curlers needs to be determined