Positron Background

06/04/2012

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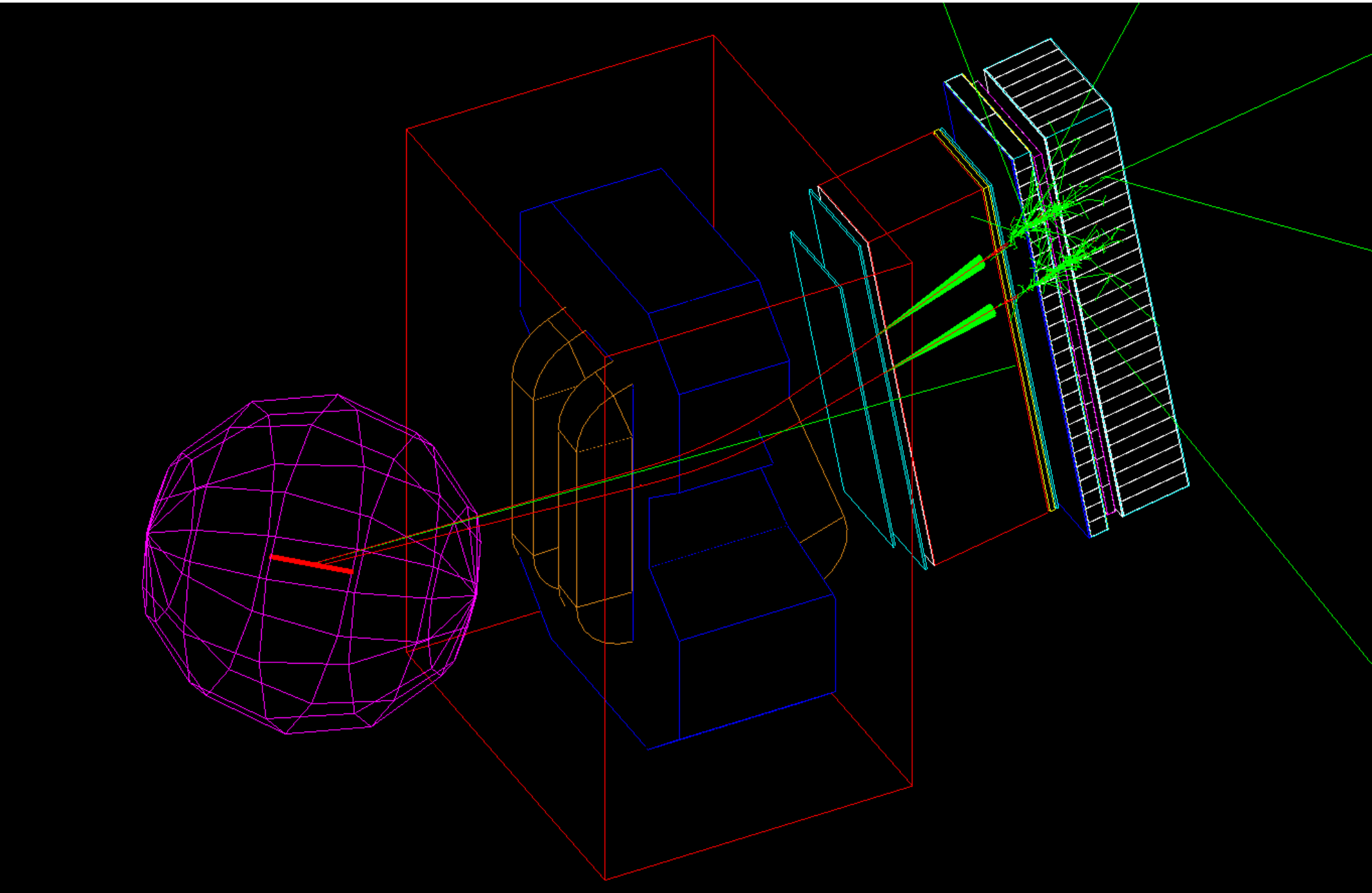
Geometry



Cuts

Total shower threshold – shower energy + preshower energy > 0.45 (for 5 pass data)

Out of plane cut - | BB.tr.tg_th | < 0.2 (12 degree)

Target Z cut - | BB.tr.vz | < 0.17 (17 cm)

Track position at DC1 - | BB.tr.x | < 0.70 (70 cm)
Track position at DC1 - | BB.tr.y | < 0.17 (17 cm)
These cuts are found by applying projx cut on experimental and looking at BB.tr.x and BB.tr.y (position of track in drift chamber)

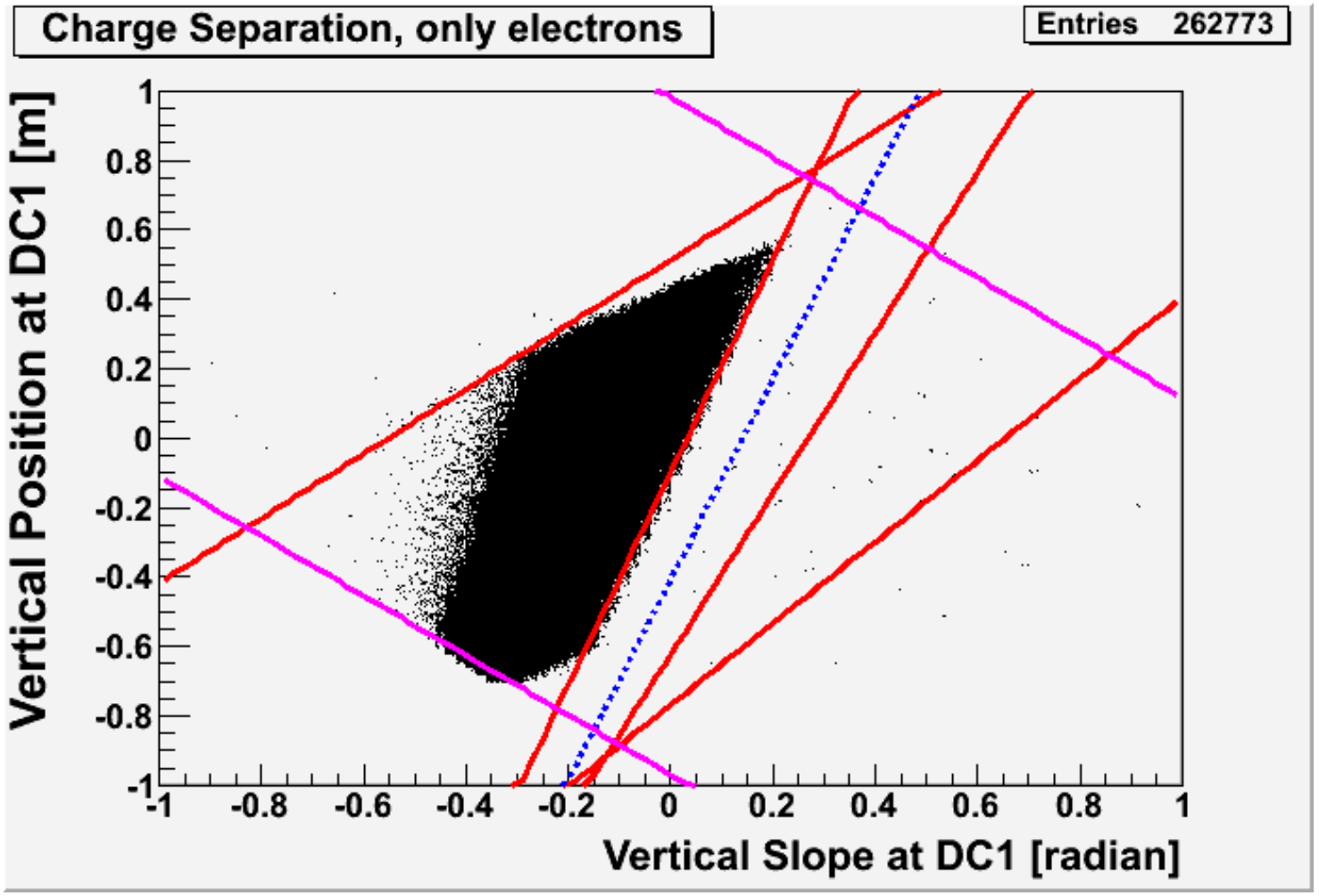
E over P cut - (0.5*BB.ts.ps.e + BB.ts.sh.e)/(1000*BB.tr.p) > 0.833
&& (0.5*BB.ts.ps.e + BB.ts.sh.e)/(1000*BB.tr.p) < 1.158"

Charge Separation, electrons

Red and magenta lines are acceptance boundaries from experimental data.

The blue line indicates charge separation.

Simulated acceptance agrees with data.

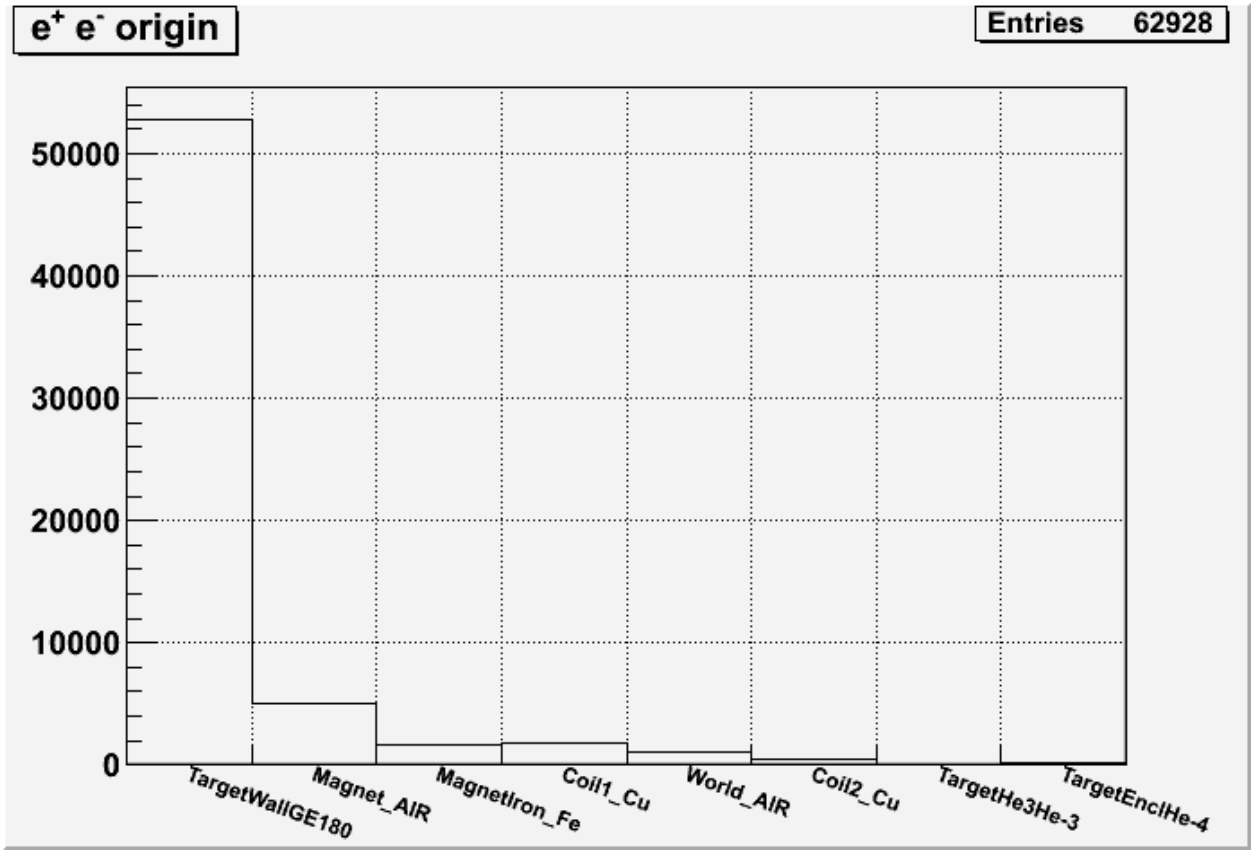


Source of Positron Background

Distribution of volumes where a e-/e+ pair is produced and background electron is passed all production cuts described in page 2.

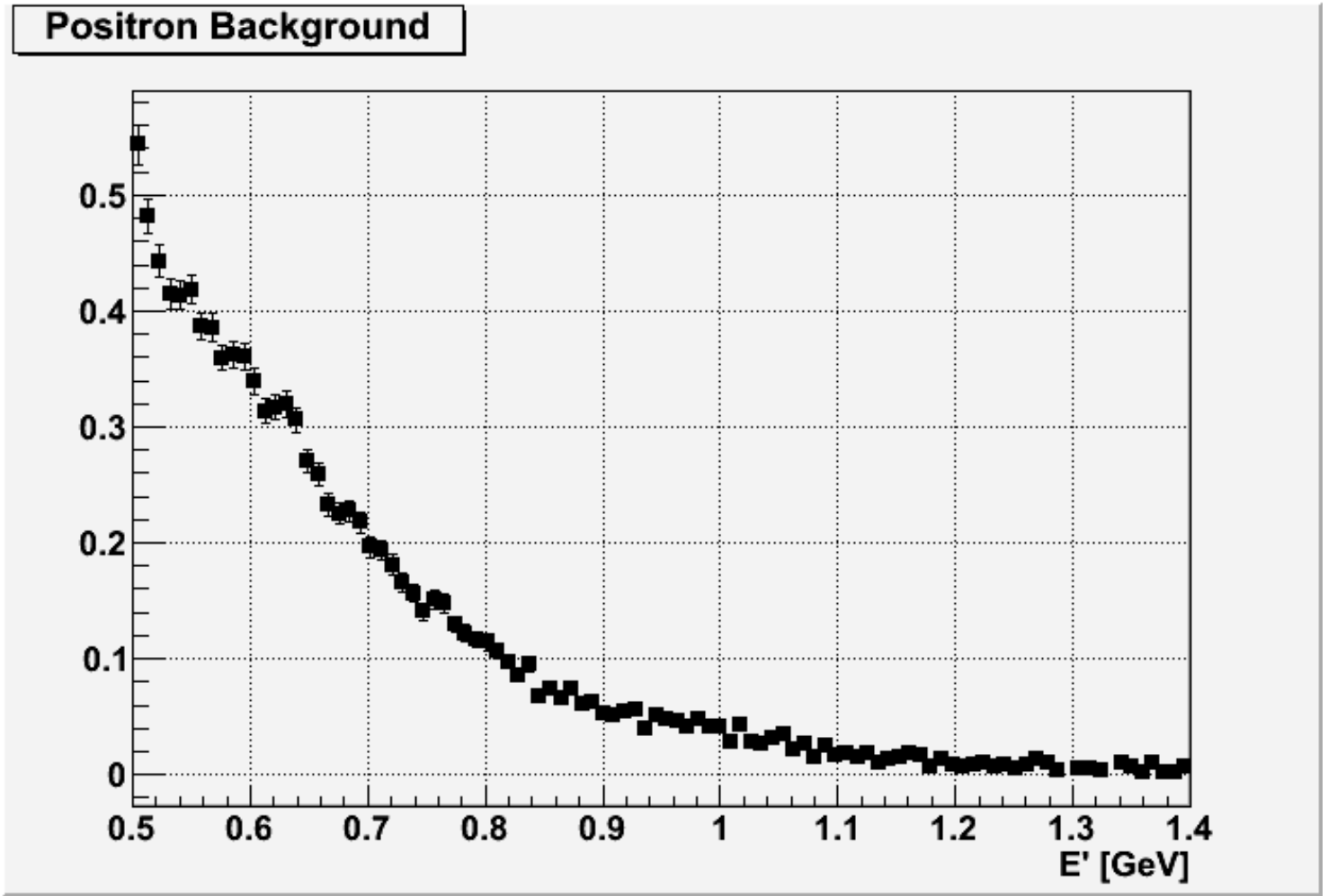
About 85% of the background comes from target glass walls.

World_AIR means e-/e+ was produced after target enclosure and before magnetic volume (40 cm before magnet yoke).



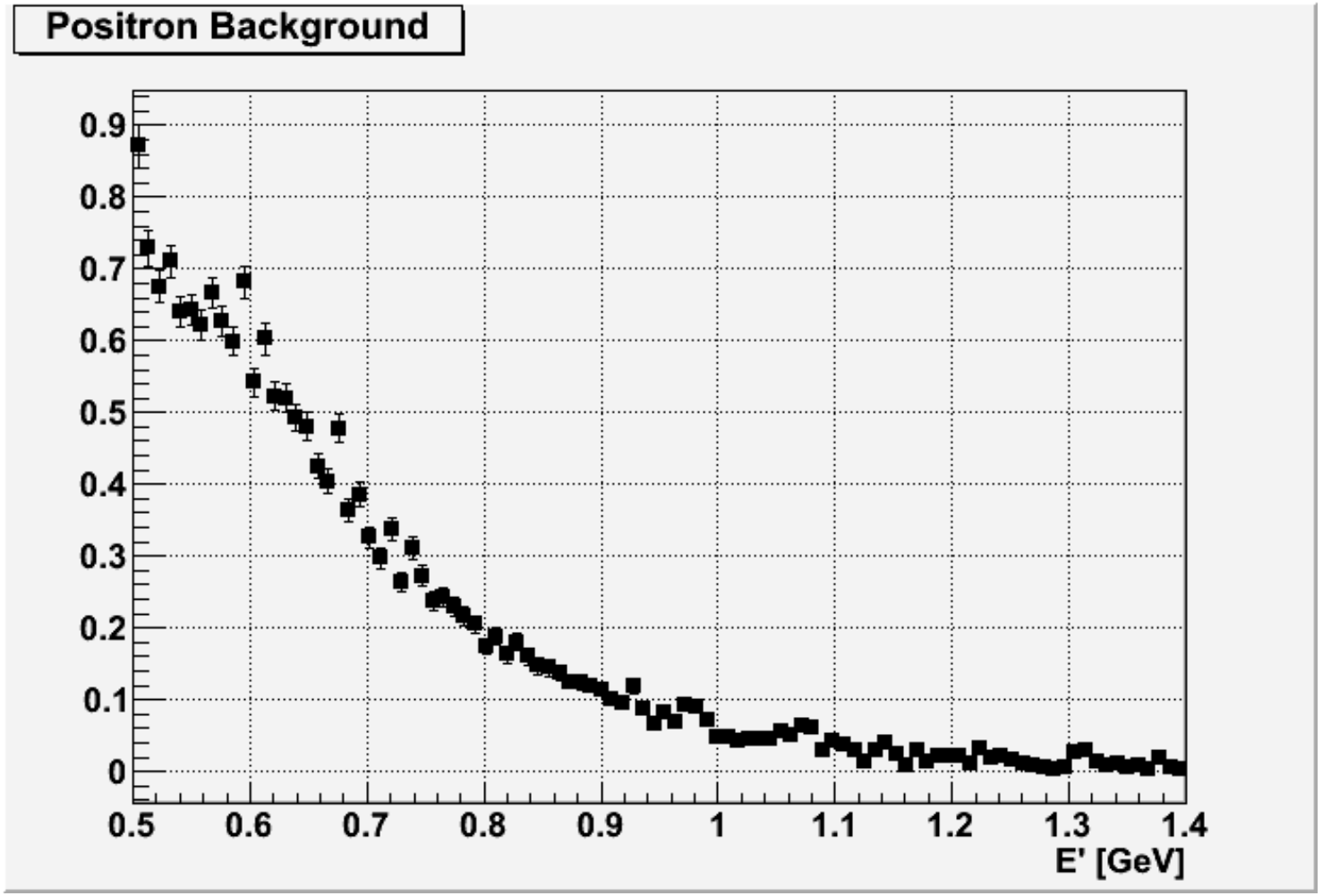
Positron Background 4.74 GeV

Ratio of background electrons to real electrons after cuts defined in page 3.



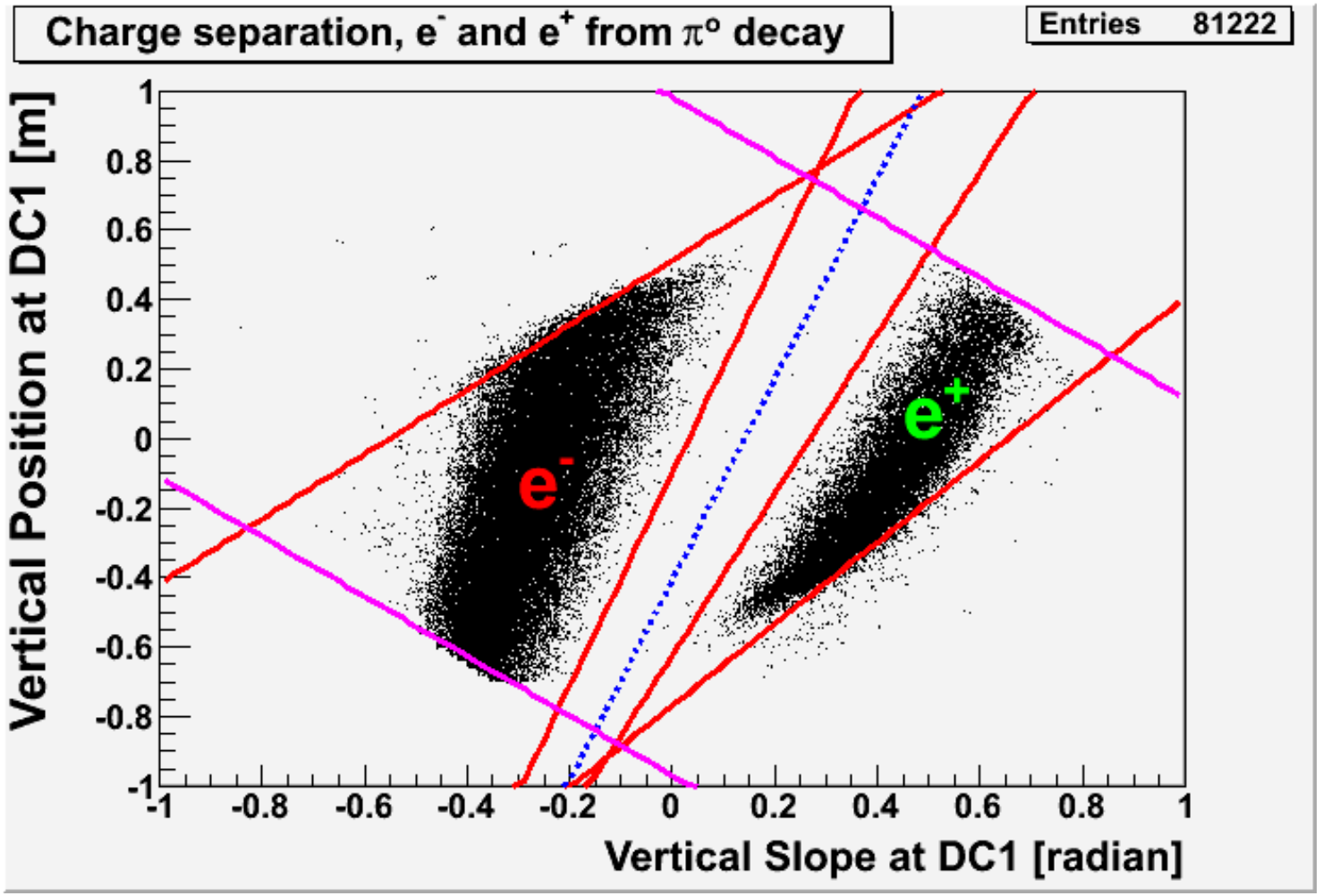
Positron Background, 5.892 GeV

Ratio of background electrons to real electrons after cuts defined in page 3.



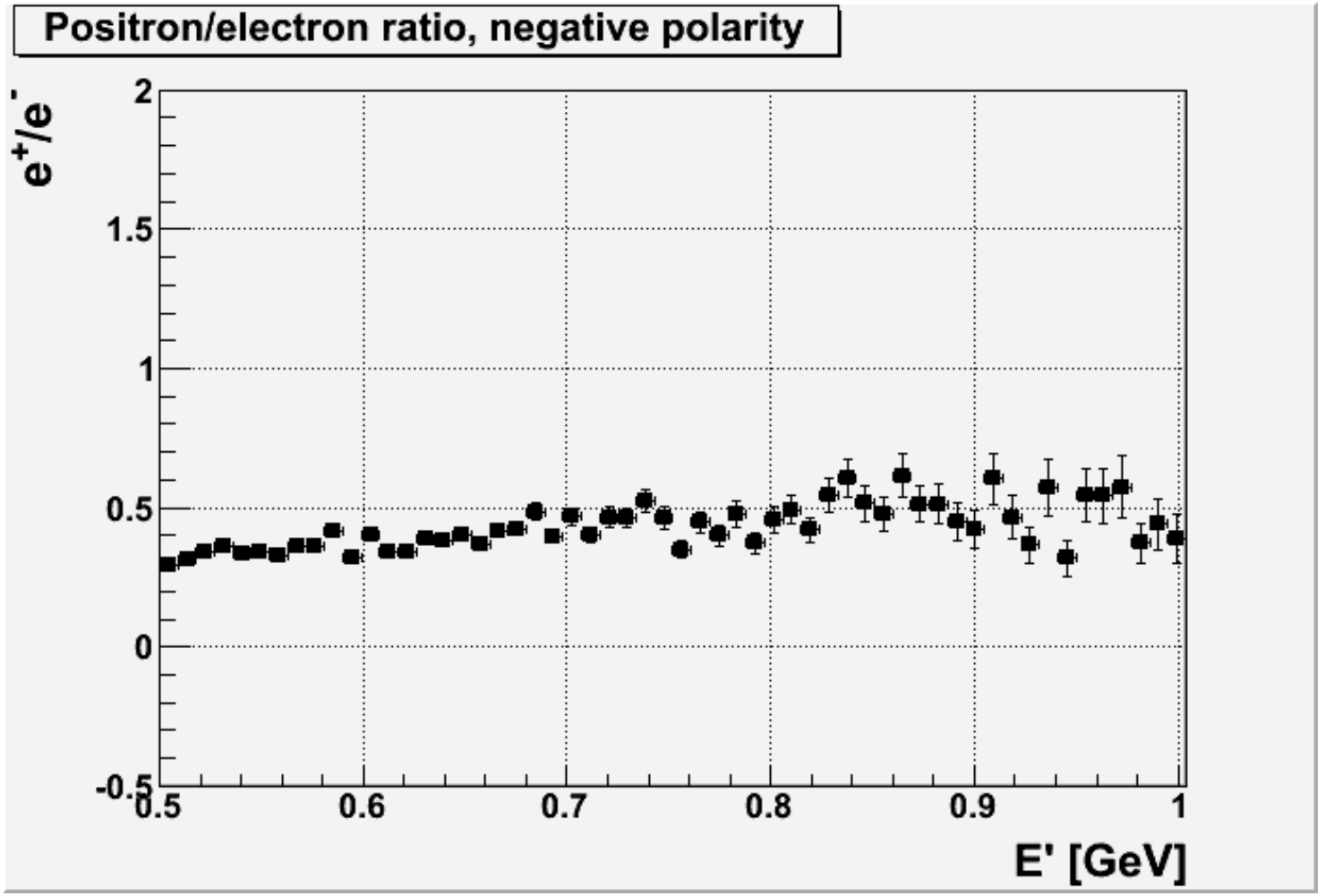
Charge Separation, Pi0 decay

Track position at DC1 versus track angle when initial particle was pi0. All cuts in page 2 are applied.



Positron/Electron Ratio, 4.74 GeV

Study acceptance for e+. Magnet at negative polarity, initial particle pi0.
Ratio of positron to electrons with cuts on page 2 applied.



Positron/Electron Ratio, 5.892 GeV

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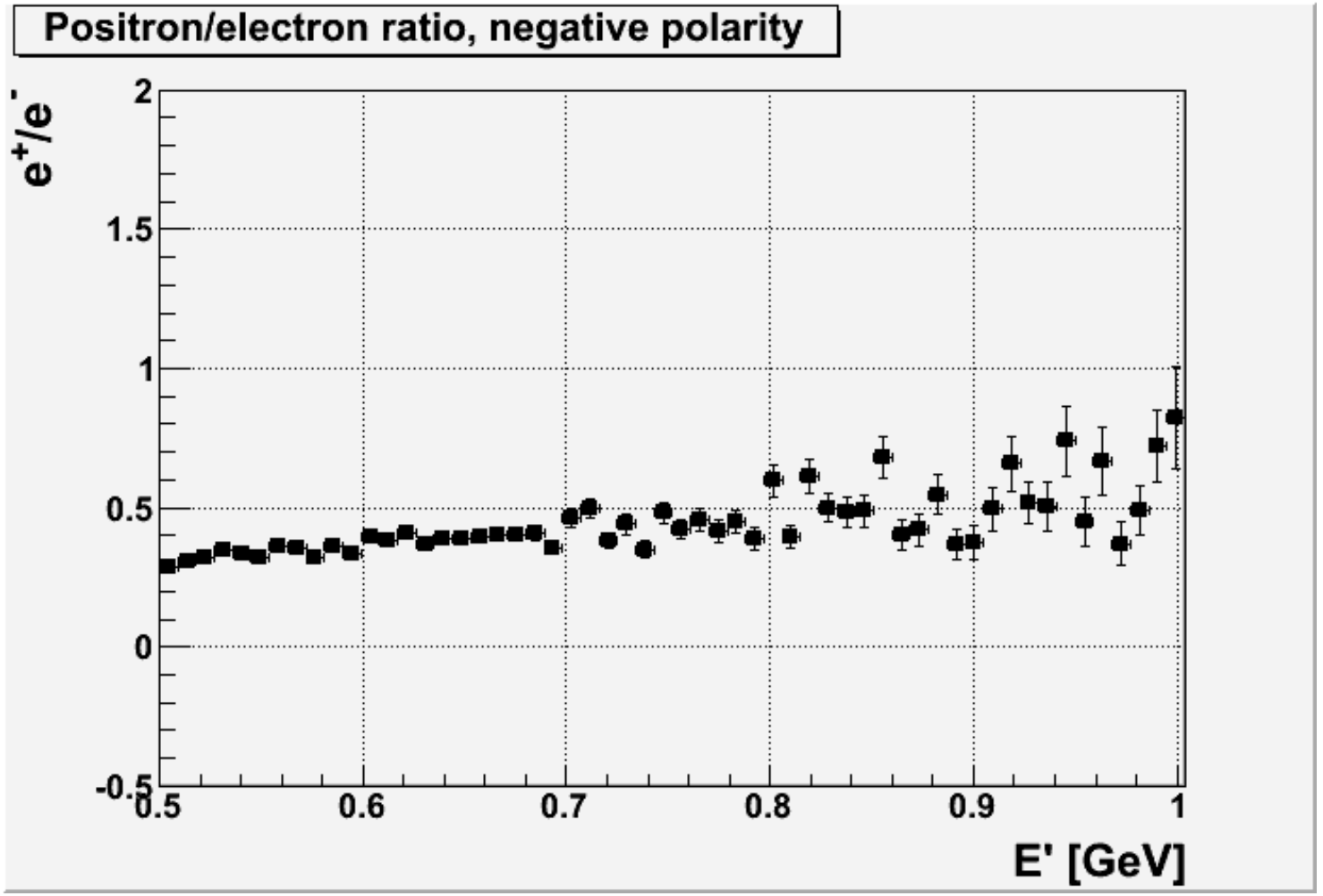

Summary

✔ Simulation allows to study acceptance of band down particles.

✔ Knowing number of band down particles at negative magnet polarity setting in experiment, the acceptance curve in page 9,10, the number of background electrons can be estimated.

- Will be useful for 5 pass data, since no positron background measurement was done.
- Pass 4 data can be used to compare simulation and data (positron background measurement was done for pass 4).
  - Matthew gave me some initial plots, but there is too much disagreement between his results and simulation. This will require further study.

- Efficiency of BigBite should be studied for band up and down particles.