Analysis Progress

for the d_2^n analysis meeting

Diana Parno

Carnegie Mellon University

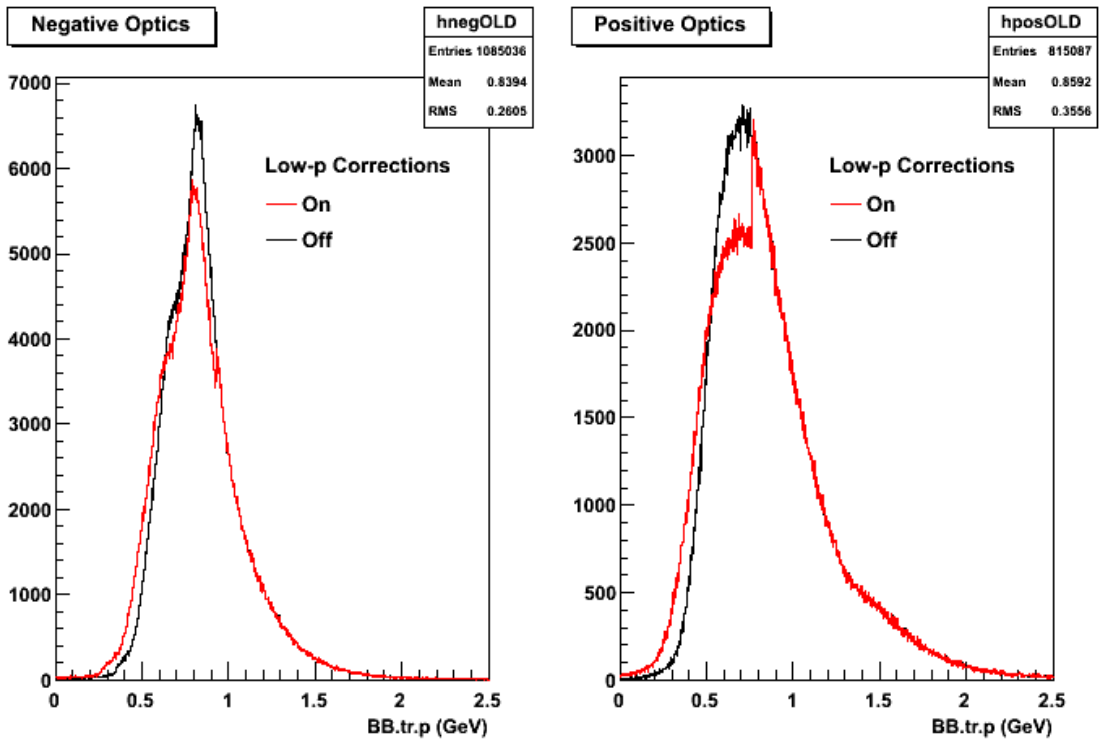
October 21, 2010

Low-Momentum Corrections (i)

- Optics code has a low-momentum correction with a threshold:

```
if (radius<0.75){
   radius = radius -0.025*(radius-0.75)/(0.65-0.75);
}
```

- Commenting it out removes the discontinuity



Low-Momentum Corrections (ii): Purpose

According to Xin:

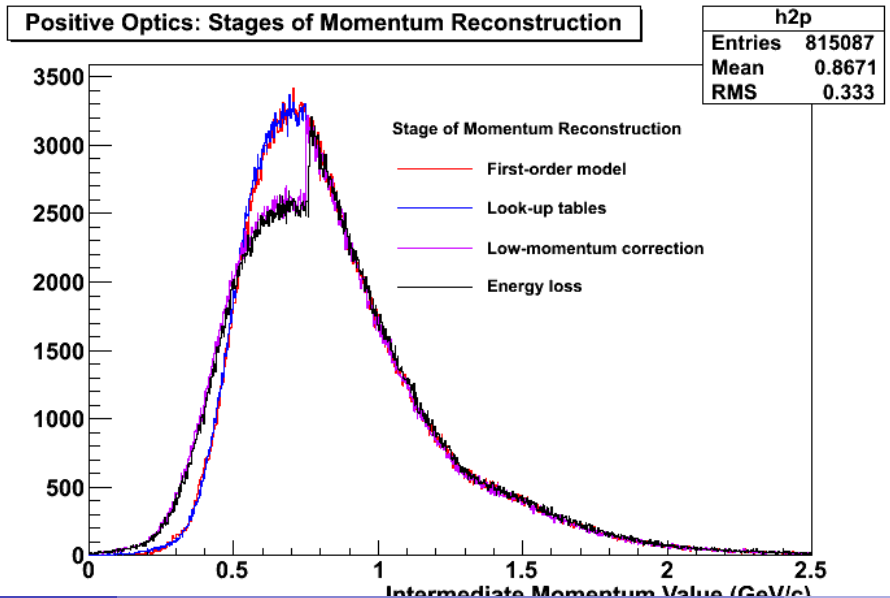
- Transversity optics calibration began with 2-pass data
- Two-pass resonances agreed well with known W, but one-pass Δ was off by 5%
- One-pass Δ had lower momentum than two-pass resonances, so it would be more sensitive to fringe field effects
- Low-p correction was supposed to align Δ without touching other resonances
- Xin designed it to be continuous, but didn't think about continuity in the first derivative

Low-Momentum Corrections (iii): Possible Approaches

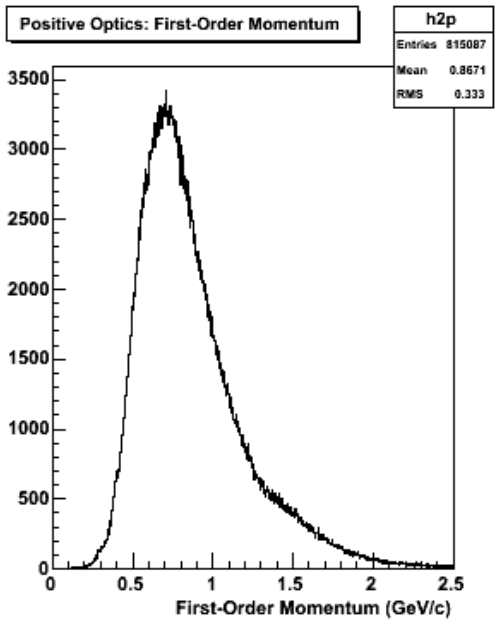
1. Drop back to first-order model and calibrate to our one-pass data.
   - We have only two calibration points: W for p and Δ
   - A global correction may have un-confirmable effects on higher momenta
2. Replace low-momentum correction with a better function
   - Find a functional form (like an exponential) that, asymptotically, has no effect on higher momenta
3. Ignore the problem
   - The discontinuity will cancel to first order in an asymmetry
   - Error in p would affect binning
   - Could complicate comparison to Monte Carlo

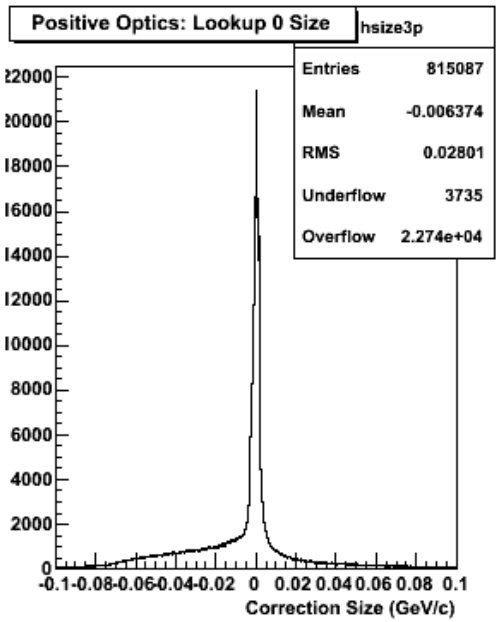
Positive Optics (i): Code

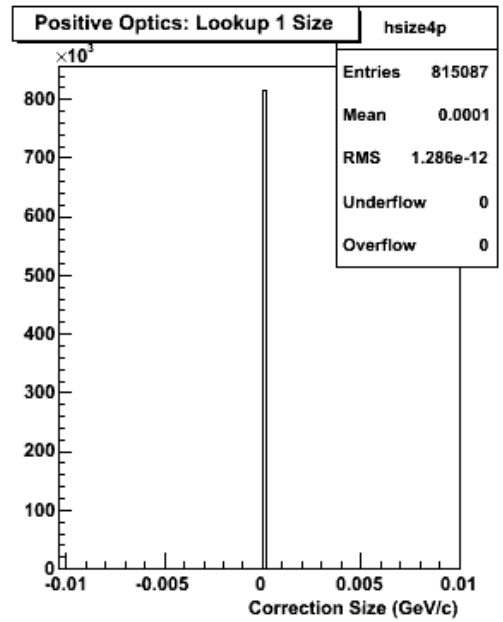
```
1 [first-order model for radius]
2 radius = radius/(4.457180+7.618057e-01*bend_y[3]+1.619582e
3 radius += mom_corr[0];
4 radius += mom_corr[1] * tr_x;
5 radius -= 0.001;
6 if (radius<0.75){
        radius = radius -0.025*(radius-0.75)/(0.65-0.75);
  }
7 radius = radius/eloss;
```

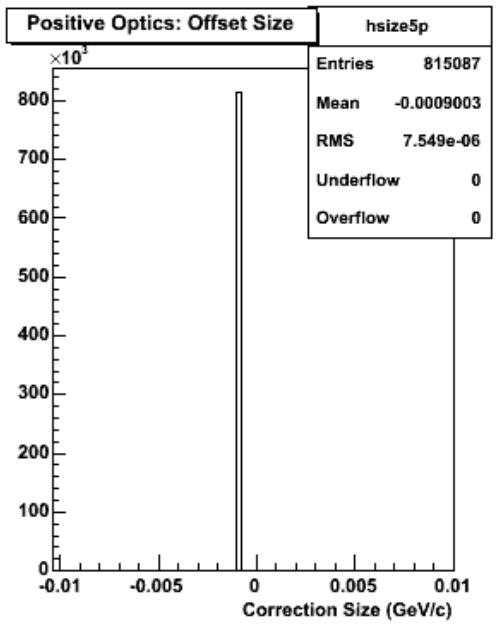


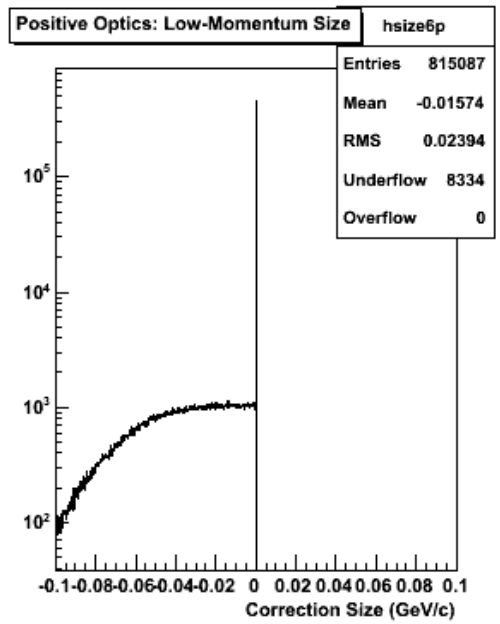
Positive Optics (ii): Correction Sizes

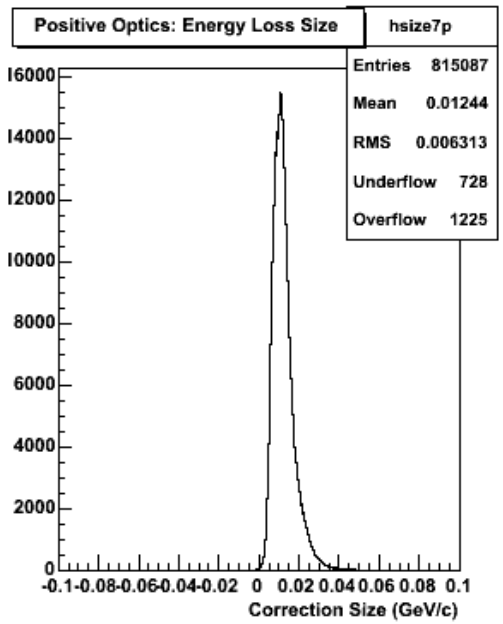








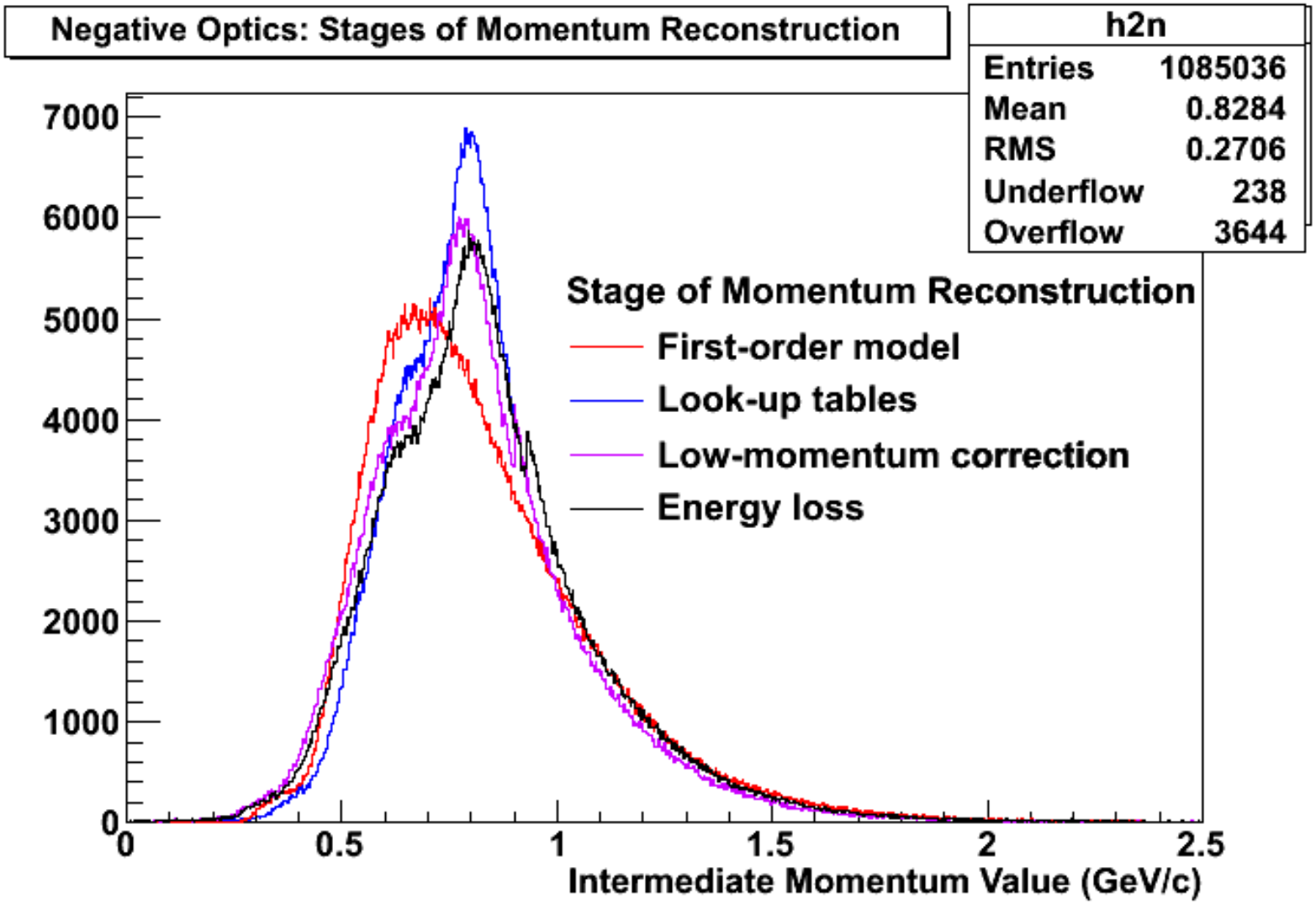




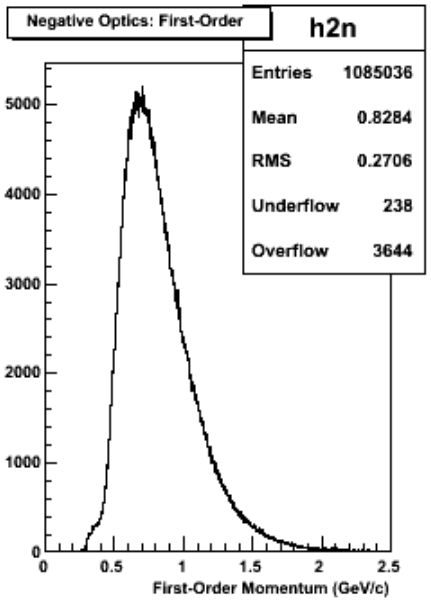
Negative Optics (i): Code

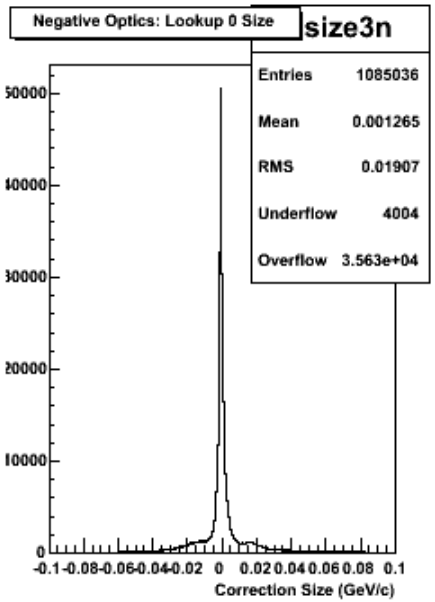
```
1 [first-order model for radius]
2 radius *= 0.222506 -0.03816242*bend_y[3]-
  0.0278703*bend_y[3]*bend_y[3];
3 radius = mom_corr[0]*radius;
4 radius += mom_corr[1];
5 radius += mom_corr[2] * tr_x;
6 radius += mom_corr[3]/bend_theta;
7 radius += mom_corr[4];
8 if(radius < 0.90){
     radius = radius - 2.1481e-2*(0.90-radius)/(0.90-0.7549)
  }
9 radius =radius/eloss;
  radius = radius * (1.+ (0.85+0.75)/2.*0.00263*(1.-3.2/6.5)
```

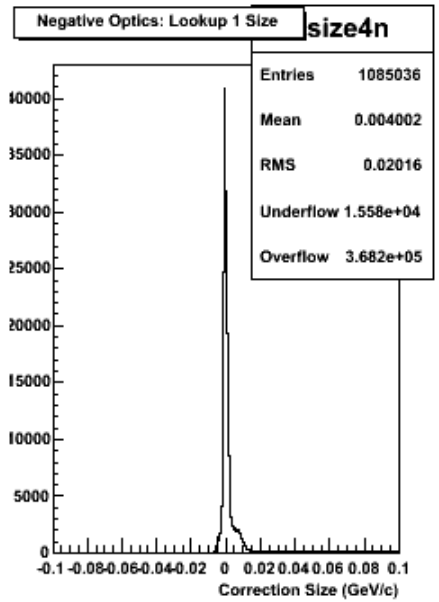
Negative Optics (ii): Intermediate Stages

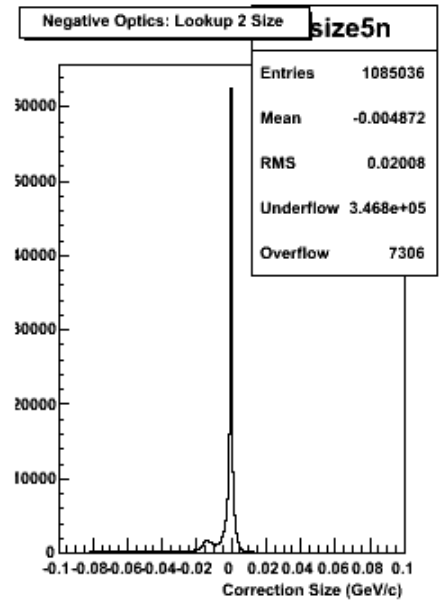


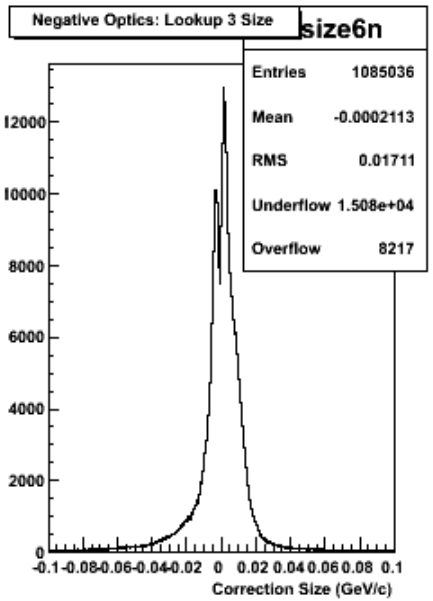
Negative Optics (iii): Correction Sizes

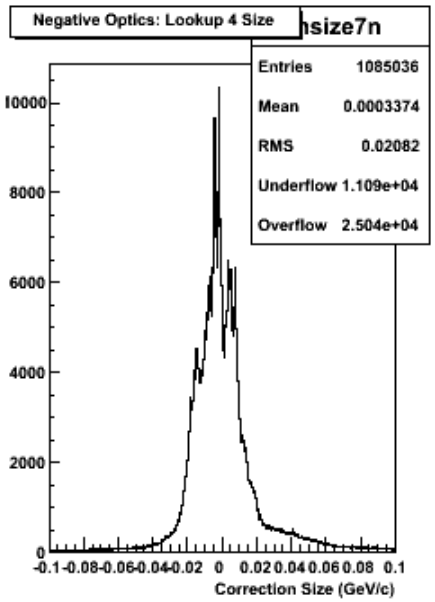


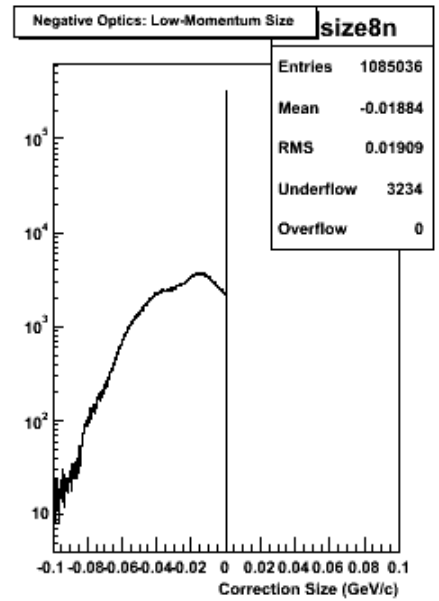


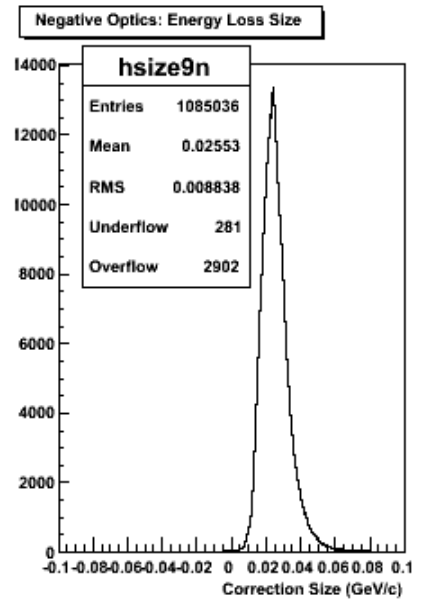




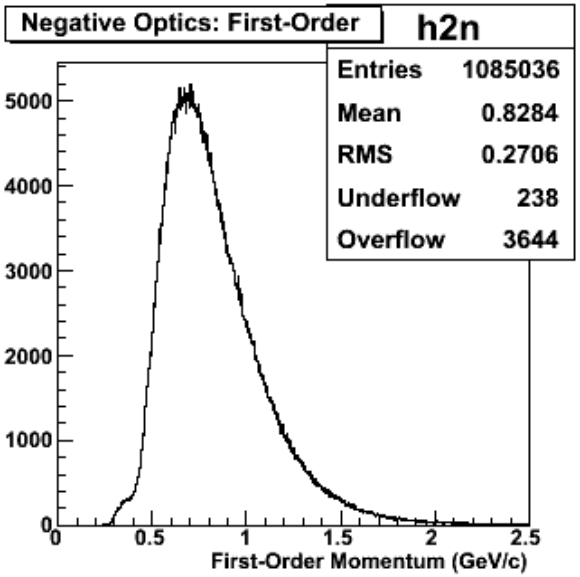


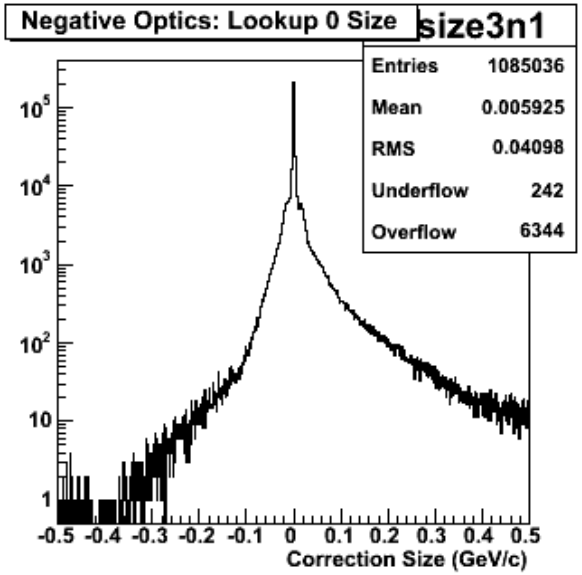


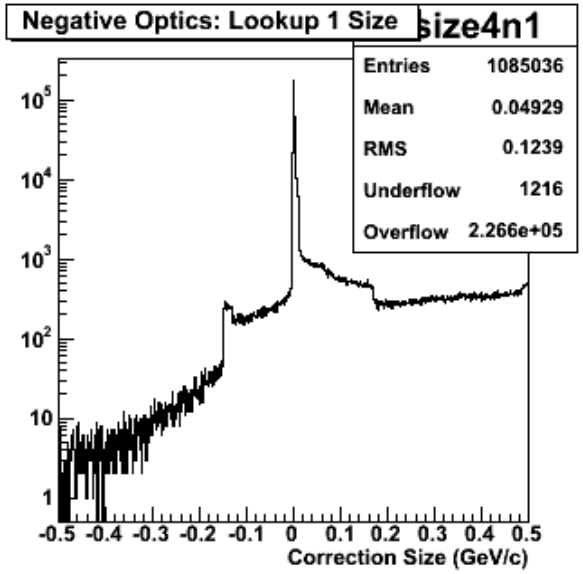


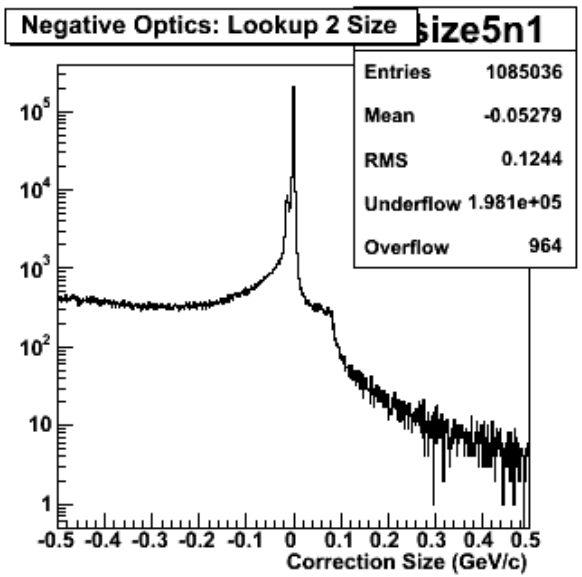


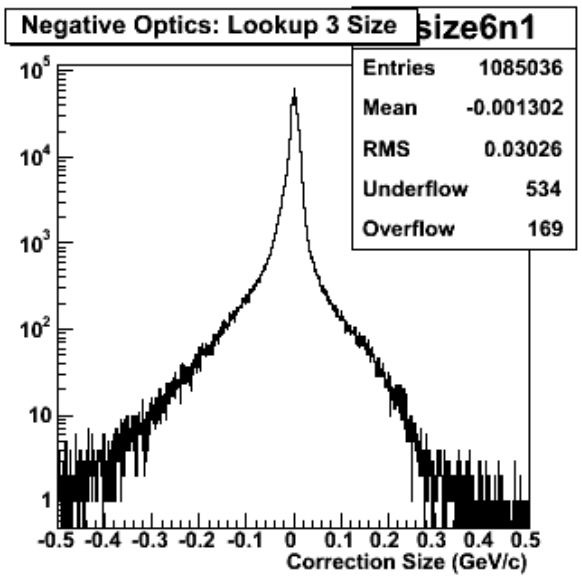
Negative Optics (iv): Lookup Table Sizes

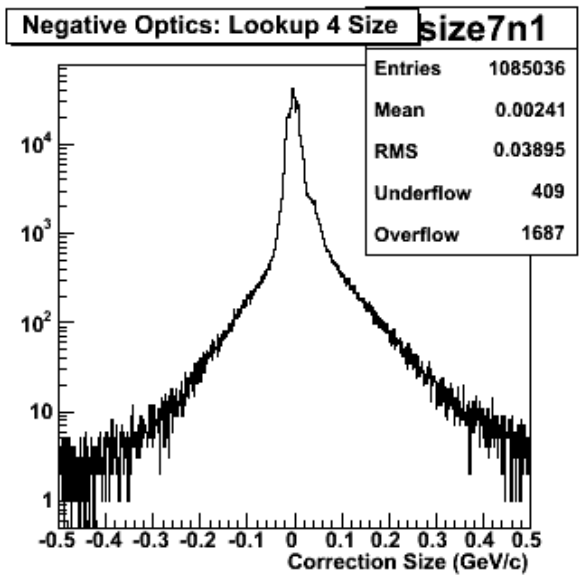








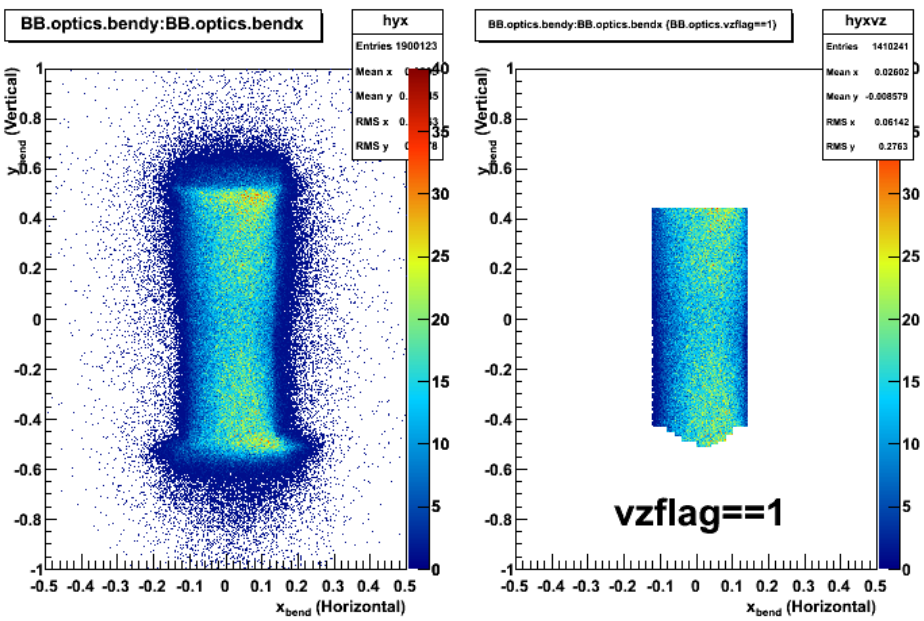




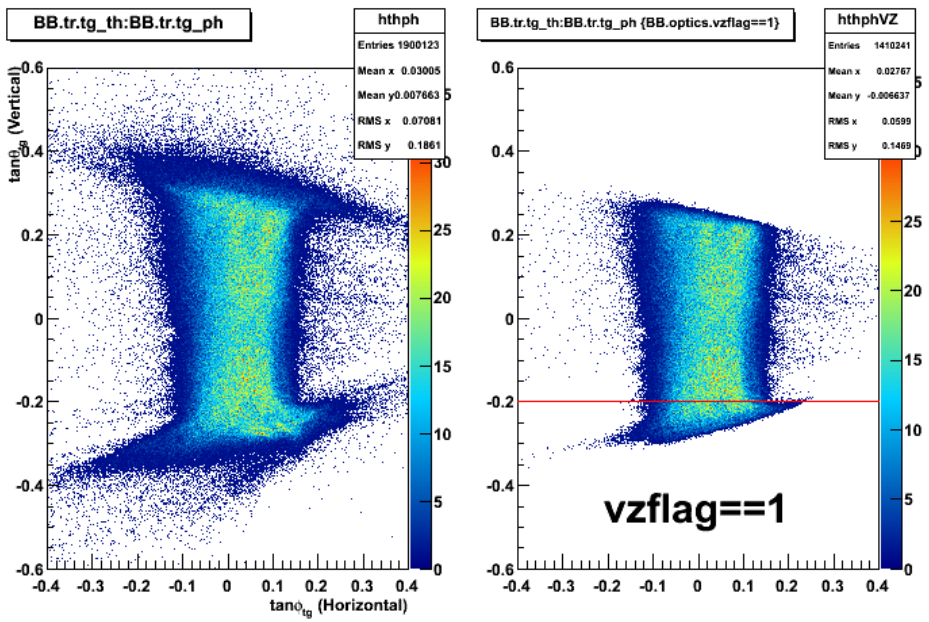
BB.optics.vzflag

- BB.optics.vzflag marks a fiducial cut on the bend plane
- Optics are supposed to be reliable for BB.optics.vzflag==1
- This cut does not exclude superelastics region

Bend Plane



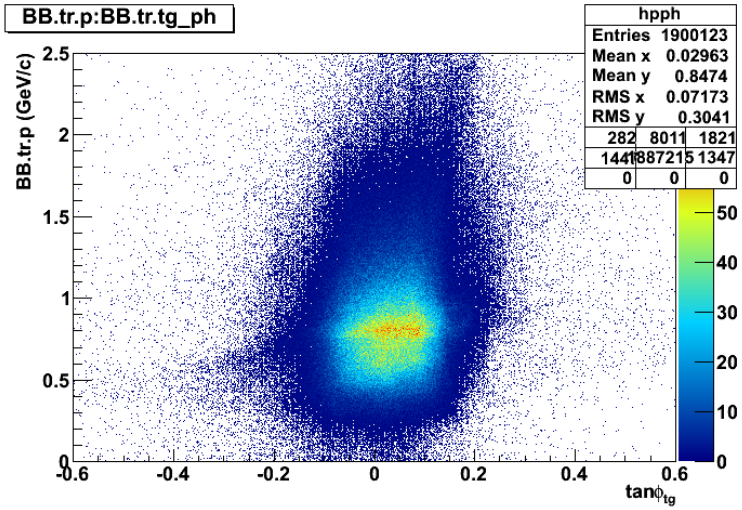
Acceptance



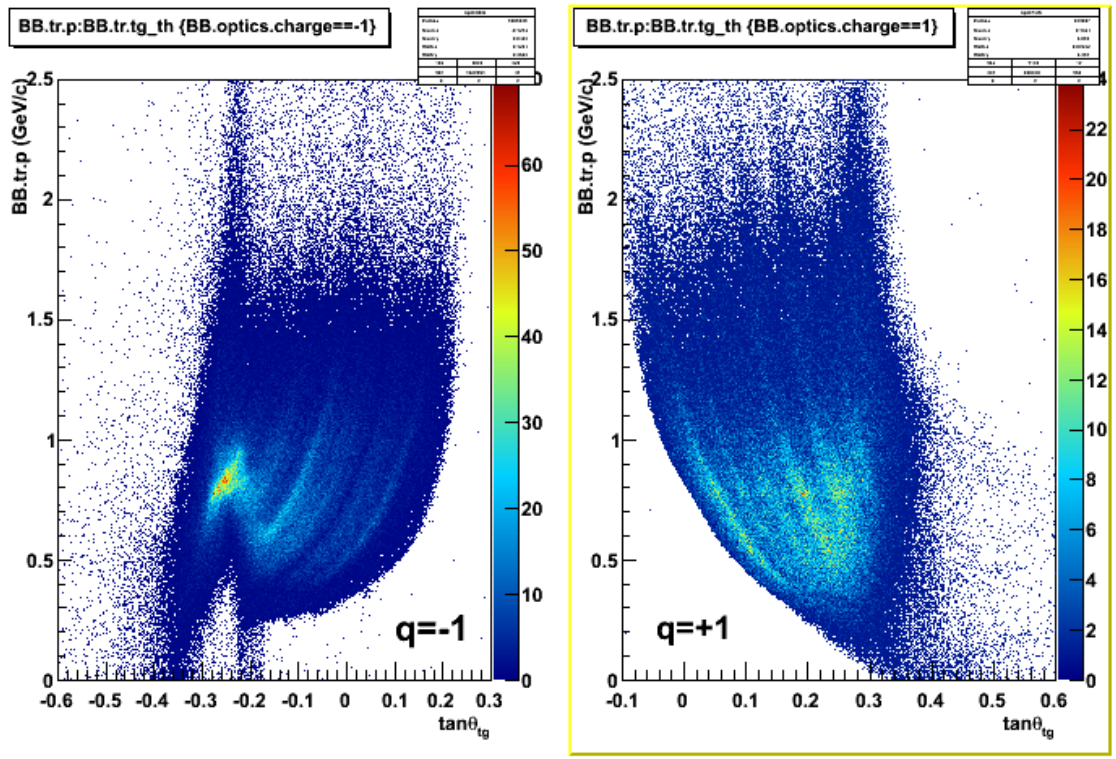
Optics and Acceptance (i)

- Are we more likely to measure certain momenta in different parts of our acceptance?

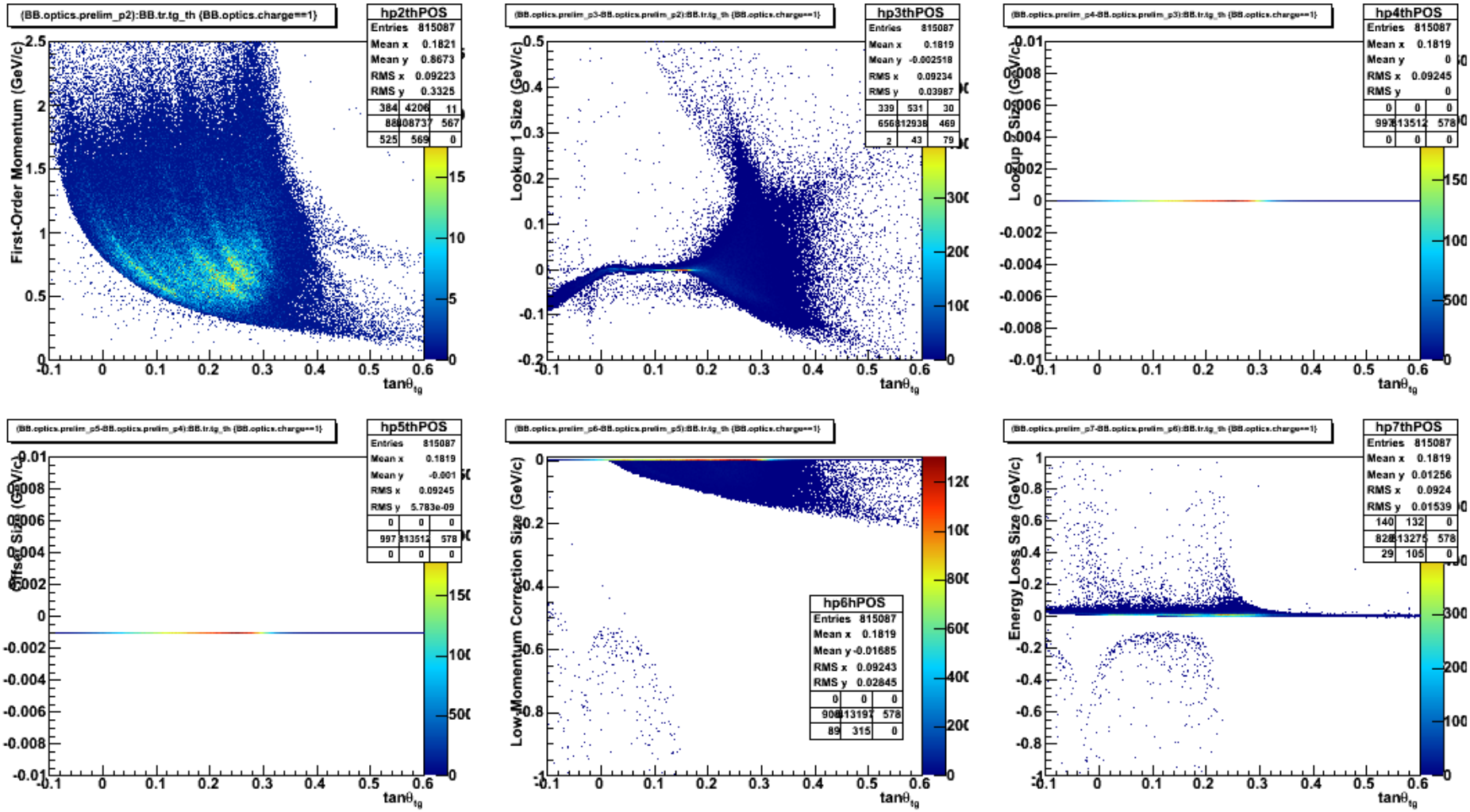
Horizontal



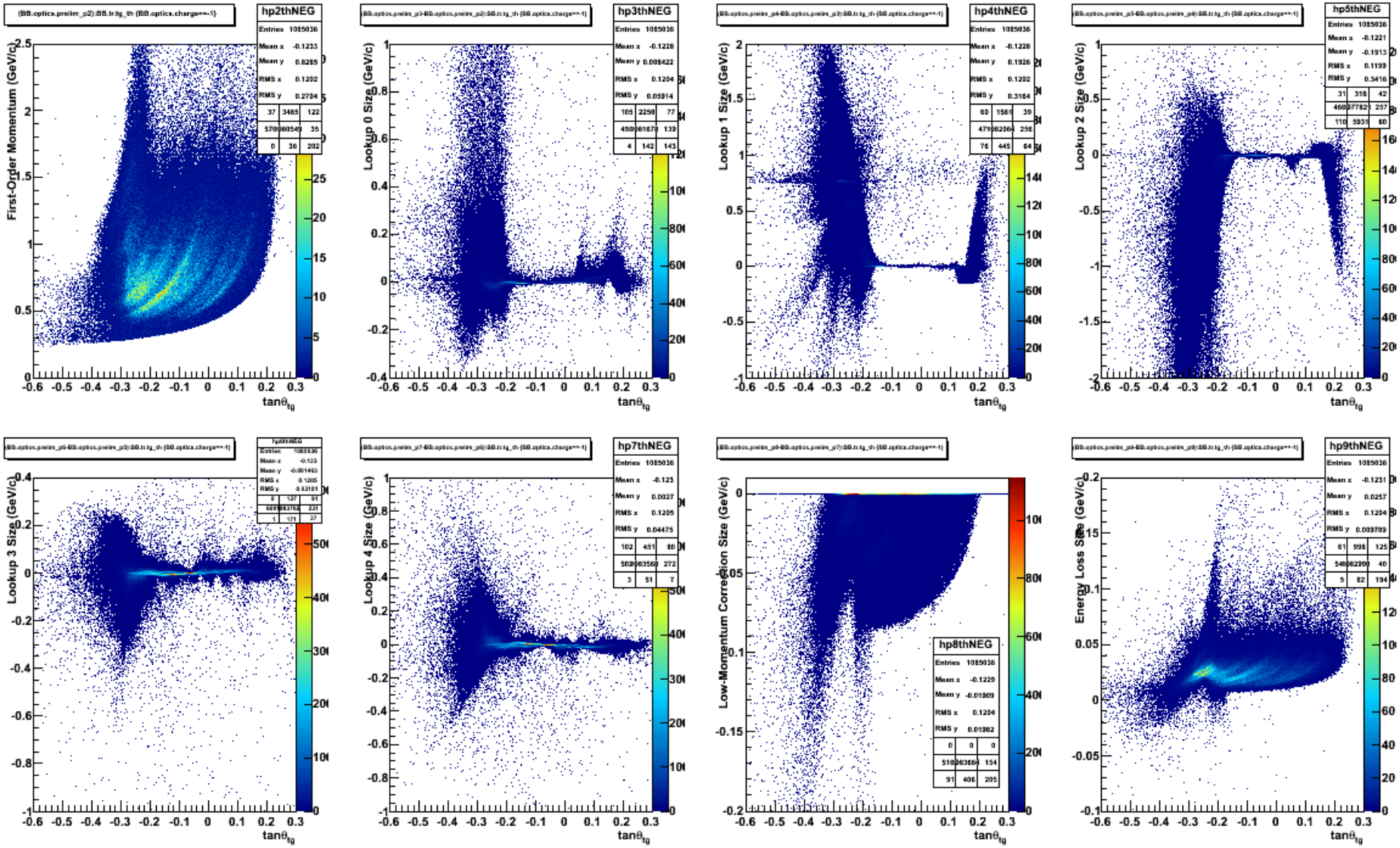
Vertical



Optics and Acceptance (ii): Positive Corrections



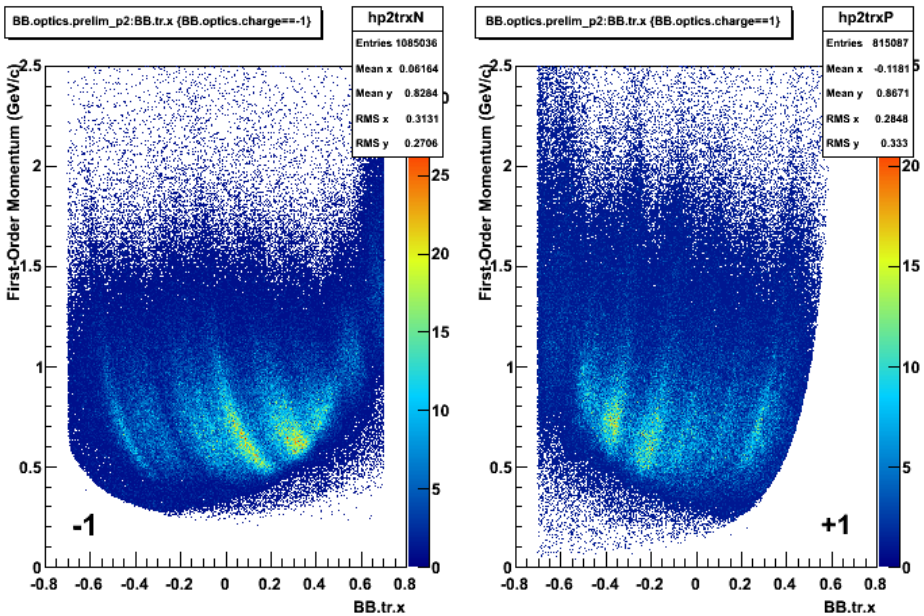
Optics and Acceptance (iii): Negative Corrections



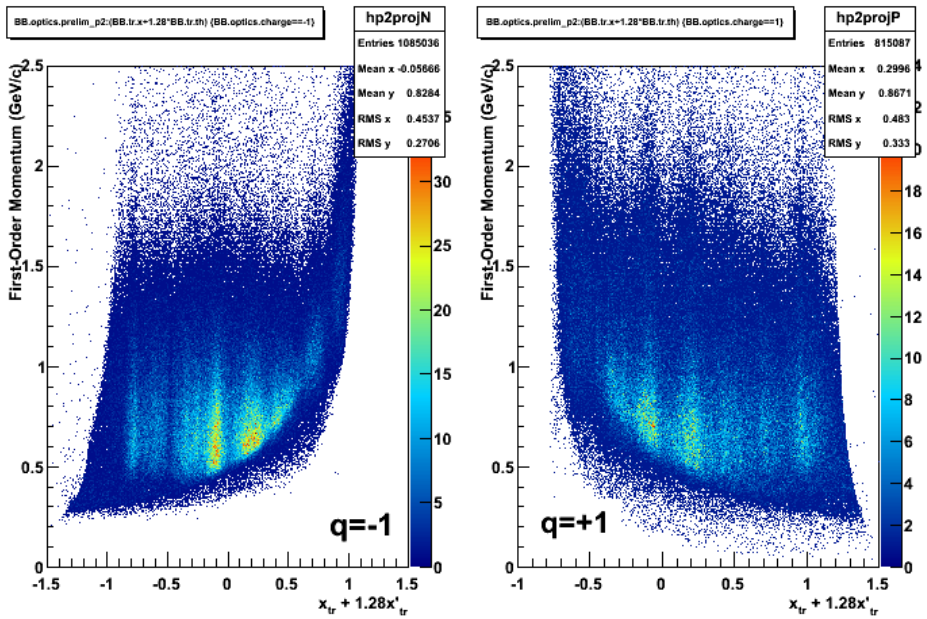
Optics and Acceptance (iv): Stripes

- The striped behavior is in the data, not in the optics.
- Looks like something to do with shower trigger...

x_{tr} at MWDC

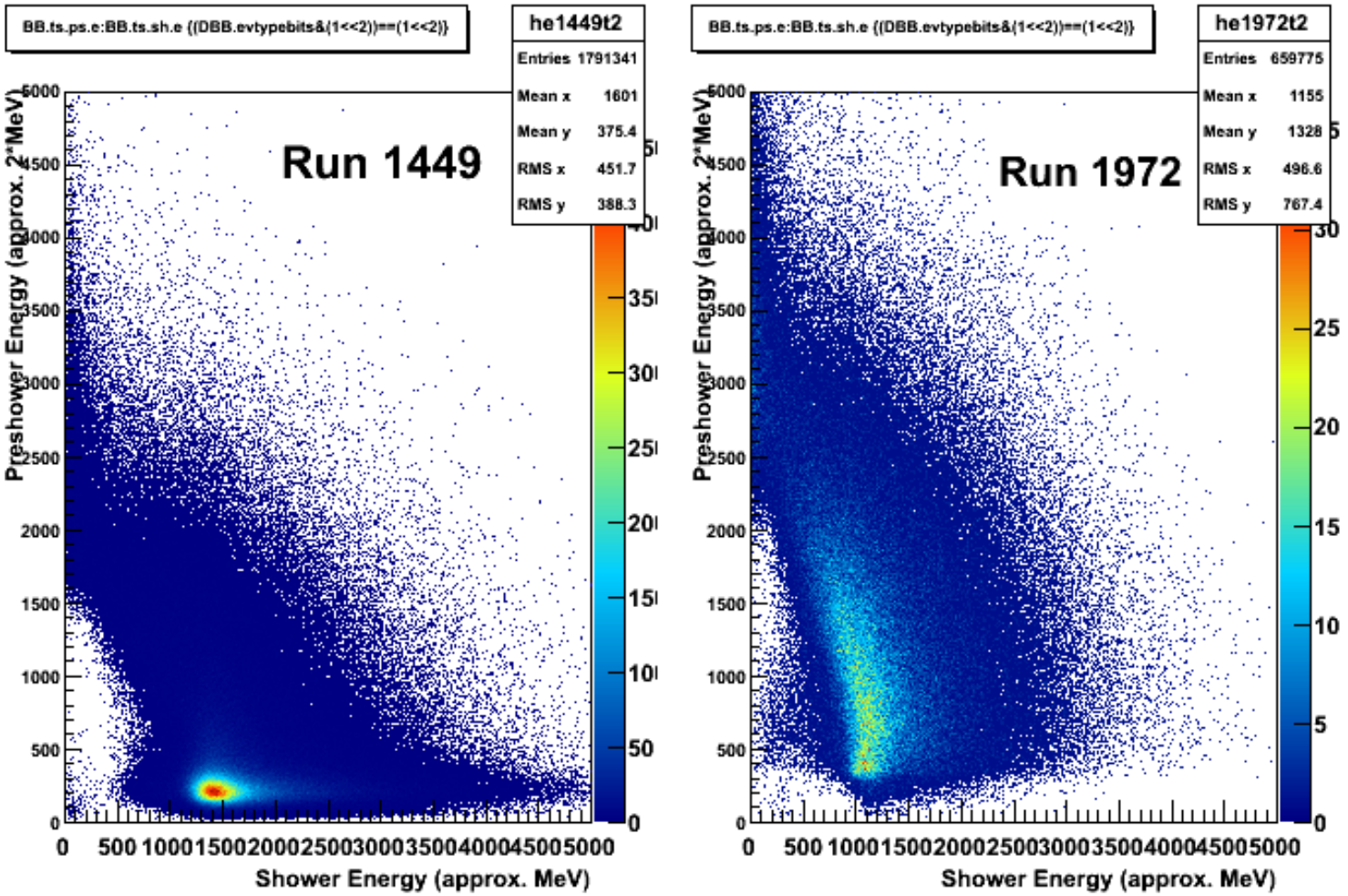


x_{tr} at Shower



Thresholds in Shower and Preshower

- The thresholds we discussed last week turn up much more clearly in a preshower energy vs. shower energy plot:



Summary

- Low-momentum optics corrections
  - Definitely responsible for discontinuities in momentum spectrum
  - May not be trivial to unwind
- "Higher-order" optics corrections can be quite large
- Momentum and acceptance
  - We see curved stripes in the vertical direction due to shower acceptance
  - Most large optics corrections are at edges of the acceptance

What's Next?

- Optics
  - Pick a strategy (roll back, redo low-energy correction...)
  - Calibrate momentum using ^{2}H elastics data
  - Study effects of momentum corrections on W^2, x_{bj}
- Asymmetries
  - Begin constructing code to compute binned asymmetries
- Beam Trip ID
  - Incorporate Dave's fit improvements
- Compton, Energy loss...