

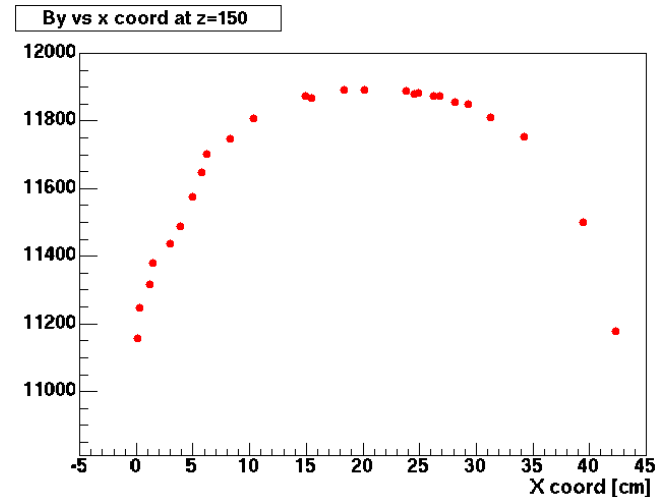
Effect of D4 on momentum determination

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July 25,2003

Background

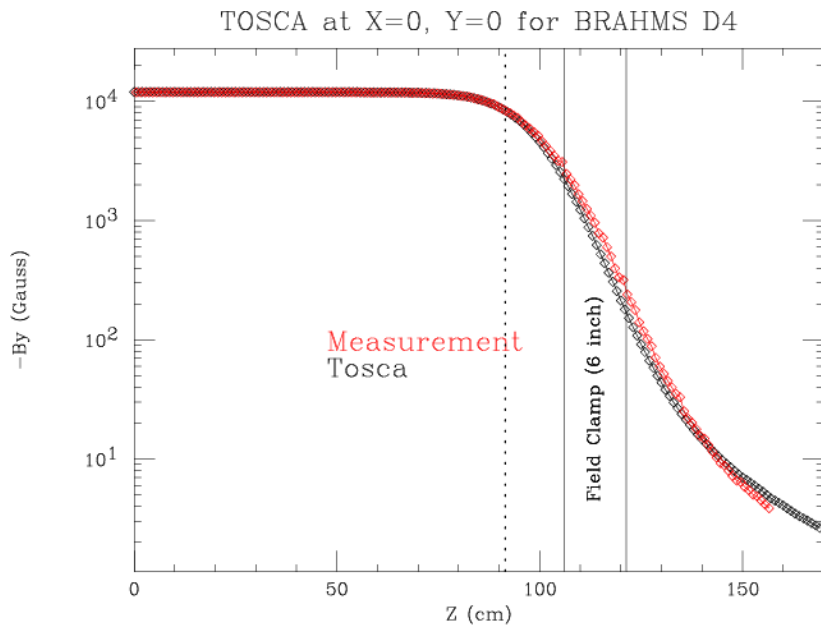
- The D3 and D4 momentum has long shown differences e.g. as pointed out by Pawel and others,
- D4 does not have a full height coil and is thus known from the both design and field maps measured by Ramiro to have a non-uniform B_y component vs. x .



Mapping results. Much more on

See http://www4.rcf.bnl.gov/brahms/WWW/private/detectors/debbe_proj/status-projects.html#magnet

Map vs. Tosca



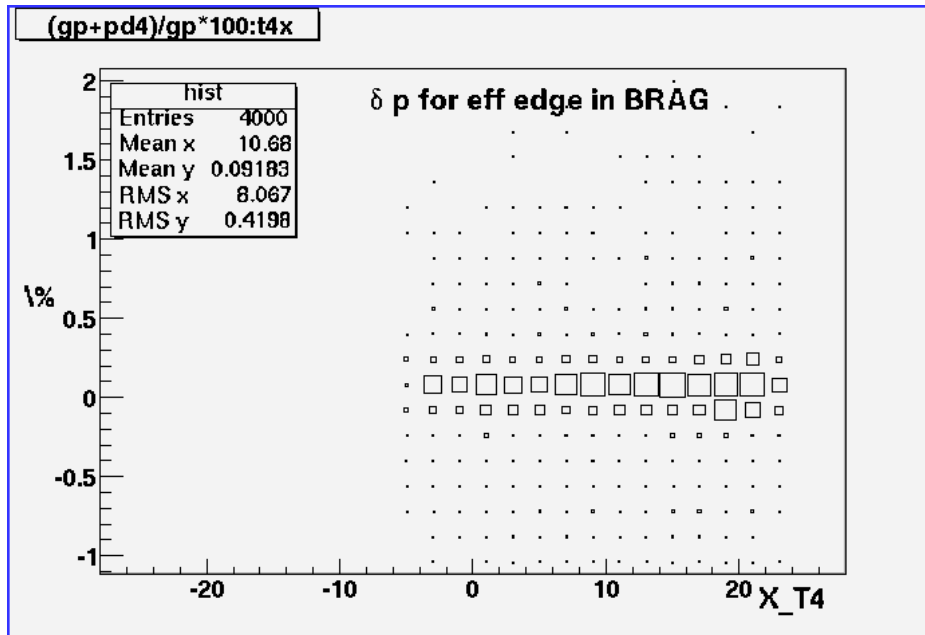
The field at mid plane has been measured (RD) and calculated by JHL. An comparison at $B \sim 12\text{kG}$ is shown to the left. There is a small difference. At the entrance/exit.

The effective length is ~ 96 an 98.8 cm respectively. How does other components look ?

Checkout of field map effect

- The Tosca field map was given to me by JH, in grid points of 1*1*1 cm.
- Brag had all along hooks setup for reading a field map. These were implemented and can easily be extended to other magnets.
- The field was scaled to the mid-field from Tosca vs. the 12 kG setting.
- The idea is to throw particle via Brag using the field map, and reconstruct the momentum in D4 using the effective edge approximation I.e. basically what we presently do in brat.

Control of effective edge field



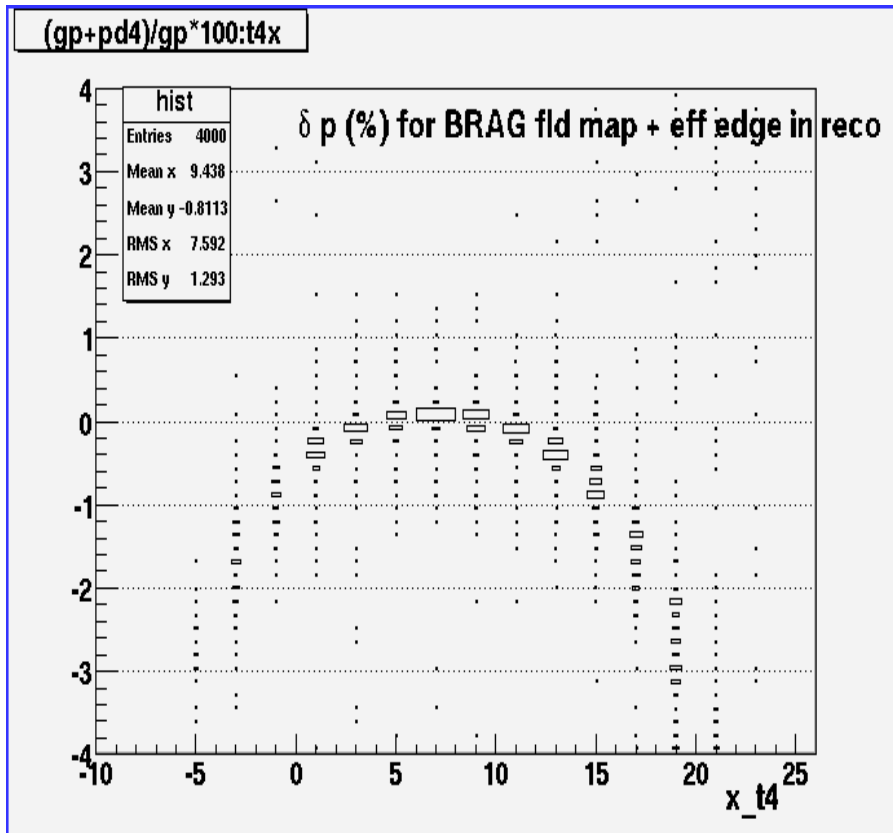
No dependence with X is seen and the diff is ~ 0

Difference of momentum determined from tracking and input pion momentum vs position of track in T4. No multiple scattering, hadronic interaction and decay turned on in sim.

I do not understand the scatter – The reco simulation digitizes the DC with 0 pos. resolution and reconstructs track

I believe this comes from digitization/local tracking. It is not from the geant side.

Same simulation with Tosca map



Several % deviations are seen across the magnet. Similar dev is seen when plotted vs. P(input).

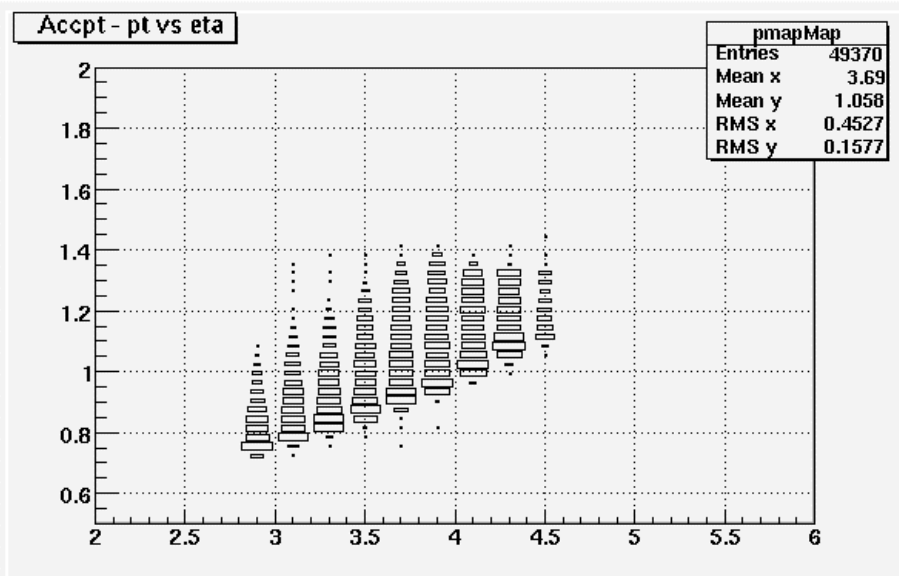
The shape difference resembles what Pawel has shown earlier for difference between D3 and D4 determined momentum.

The effective length used is that from the Tosca map, not the measured map.

What is next

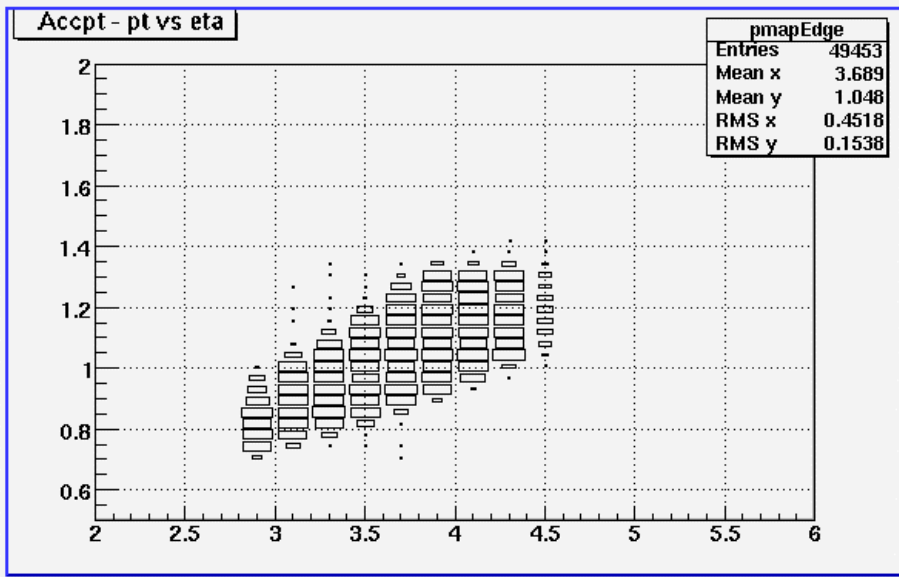
1. Should perform similar study with D3. Talked to JH about getting a Tosca map.
2. Should p be corrected using the calculated diff vs $X(T4)$ (an angle) ; Approximate Bdl with $Bdl(x)$ where x is the position at the input to D4, or should a transfer matrix be used ?
3. This does also modify the acceptance map since a given momentum particle ends up at different position and angle after D4. That this is important is illustrated in the next couple of slides. The differences are probably not as large as these since we took P to be the average of D2, D3 and D4 momentum.
4. Need estimate how important this is for the results presently obtained with the default effective edge, and acceptance maps.

Populated phase space



The following shows the populated phase space in p vs θ using the 'measured momentum'. I.e the momenta determined in D4 vs θ . Pions were thrown in the mid-plane scattering. The two plots are for swimming through the d4-map and through a constant D4 field.

As from the difference plot obvious the mom distributions are shifted toward higher p -removing flux from the lower bins and putting it higher. In additions the pattern is not a regular.



On the last slide is show the ratio of these two population now in pt vs η plane. The statistics is ~ 1000 per entry, so the deviation of 10-20% are significant.

Ratio of two populations

