

Geometrical efficiencies of a patch Pixel detector via GEANT

J. Joseph, S. Margetis and J. Vanfossen

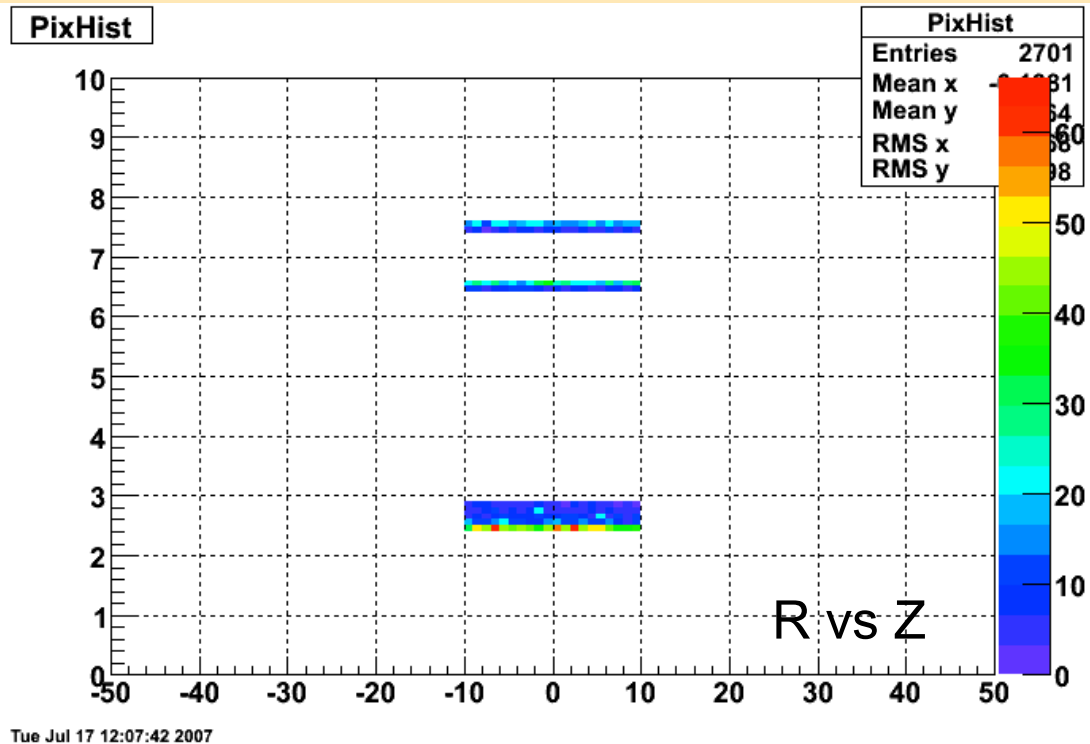
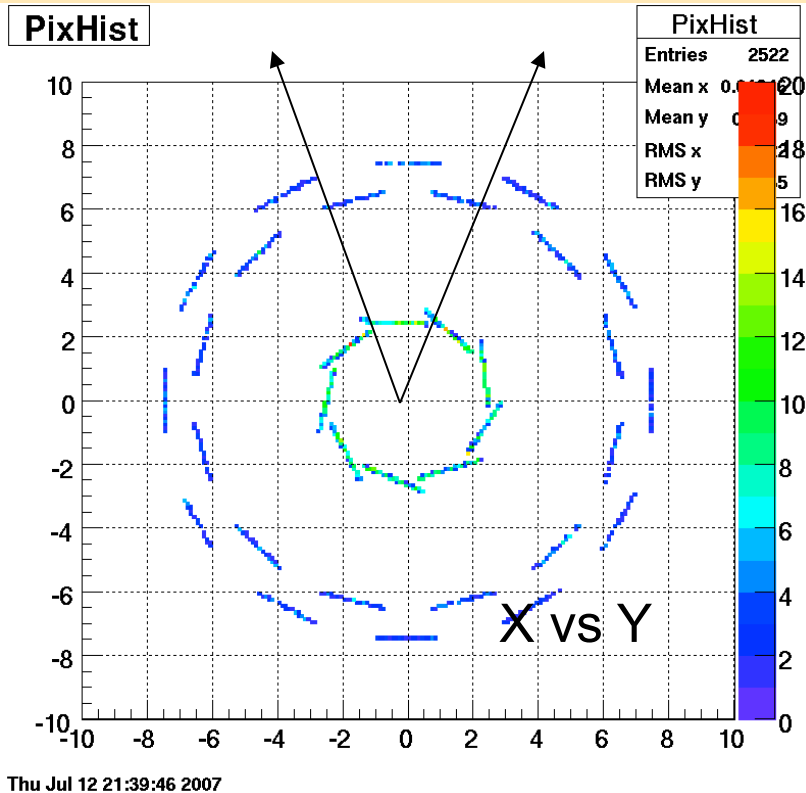
Original note based on a MathCAD simulation by H. Wieman
http://www-rnc.lbl.gov/~wieman/D_efficiency.htm and
http://www-rnc.lbl.gov/~wieman:D_efficiency_2.htm

Input data used

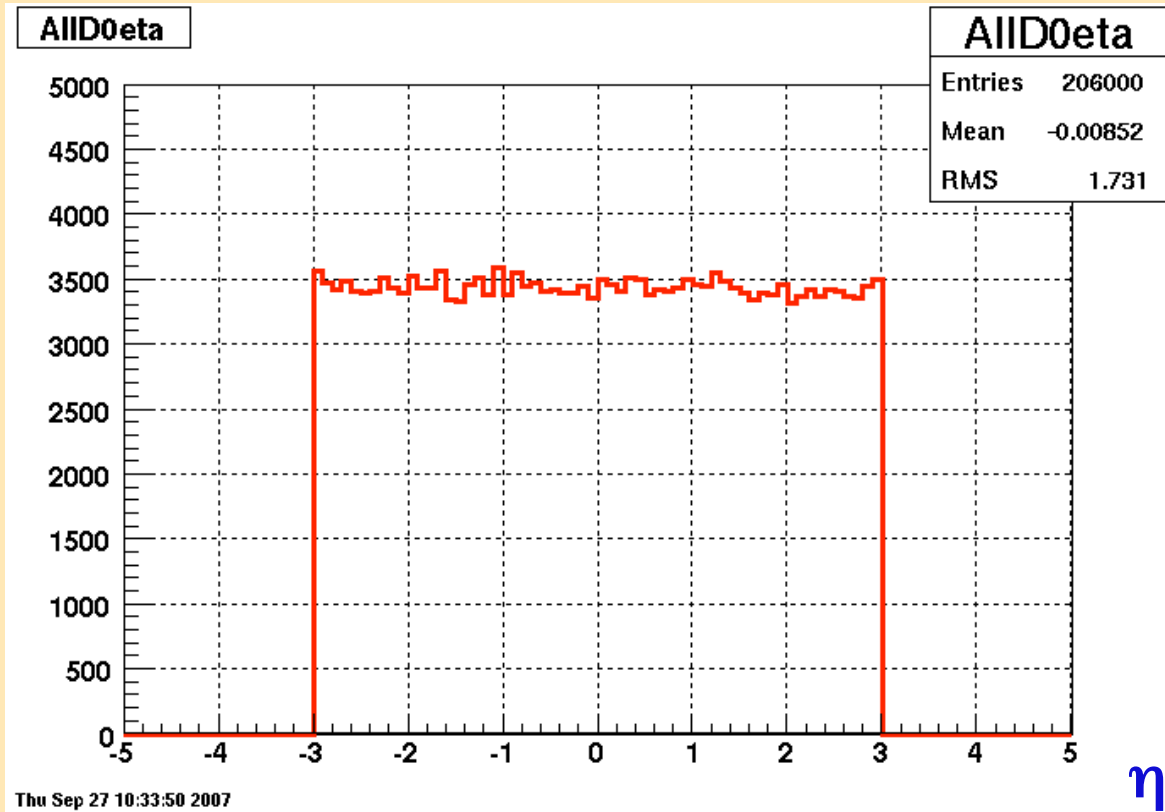
We used 'data' from our own production using the UPGR13 geometry to best match Howard's input

Sept 28, 2007

UPGR13 GEOMETRY

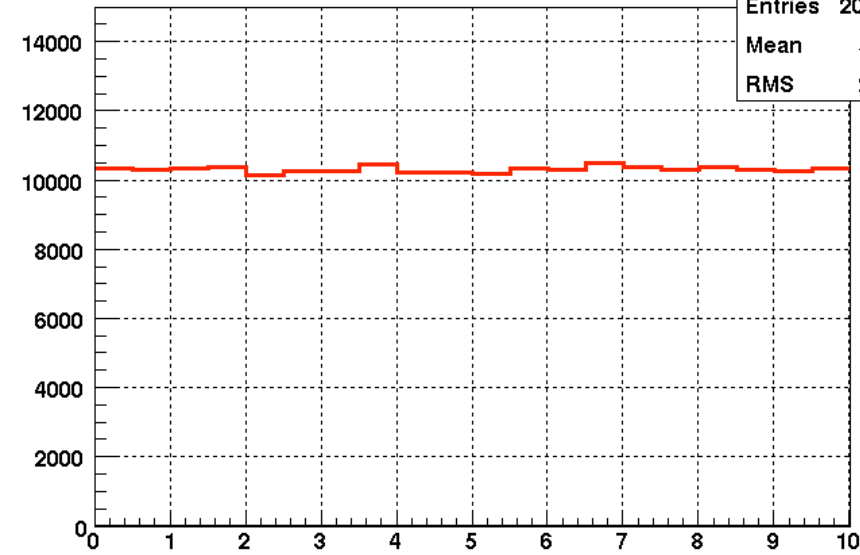


- Detector hits look fine
- Extends to $|z| \leq 10$ cm
- One Inner ladder covers 40 degrees in Phi



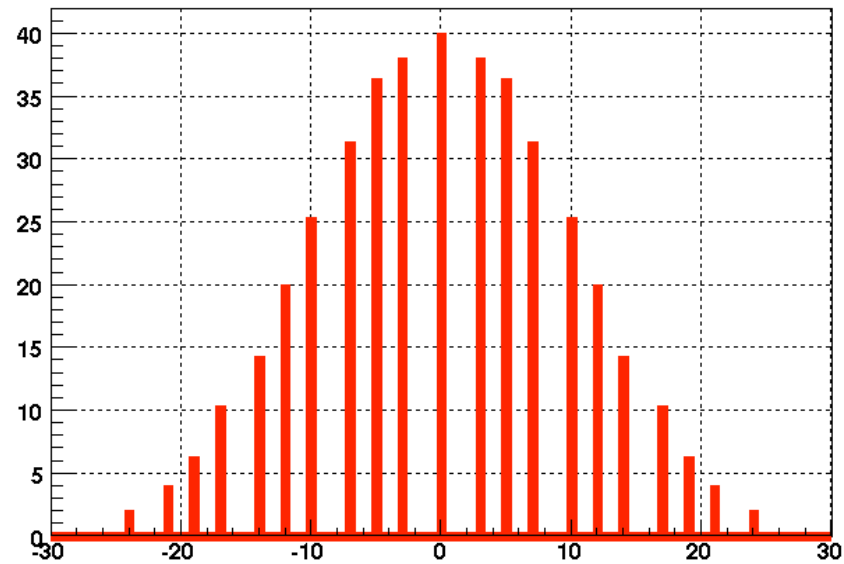
Our input has D0s uniformly in $|\eta| \leq 3$ like HW

Entries	206000
Mean	5.002
RMS	2.888



Thu Sep 27 10:25:39 2007

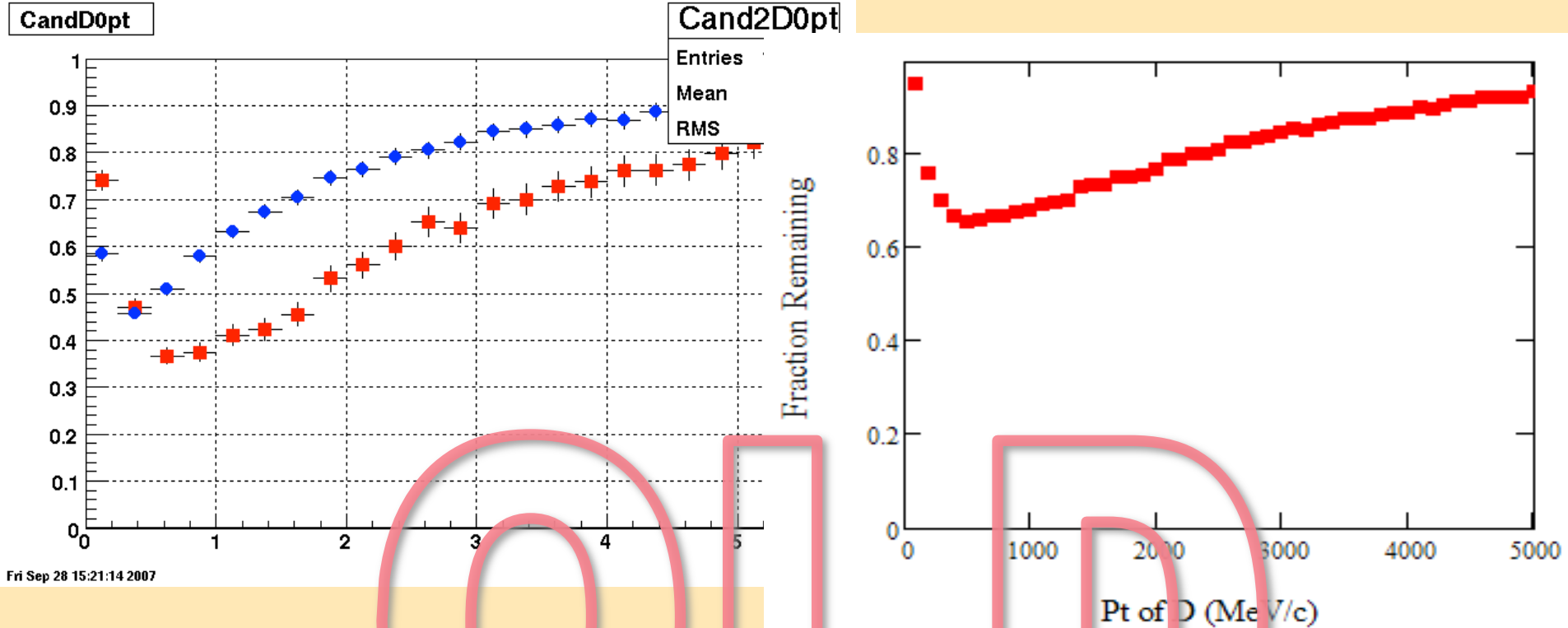
pt



Thu Sep 27 15:00:15 2007

Event_Vertex_Z (cm)

- D0s are flat in pt
- Event vertex gaussian with $\sigma = 10$ cm like HW



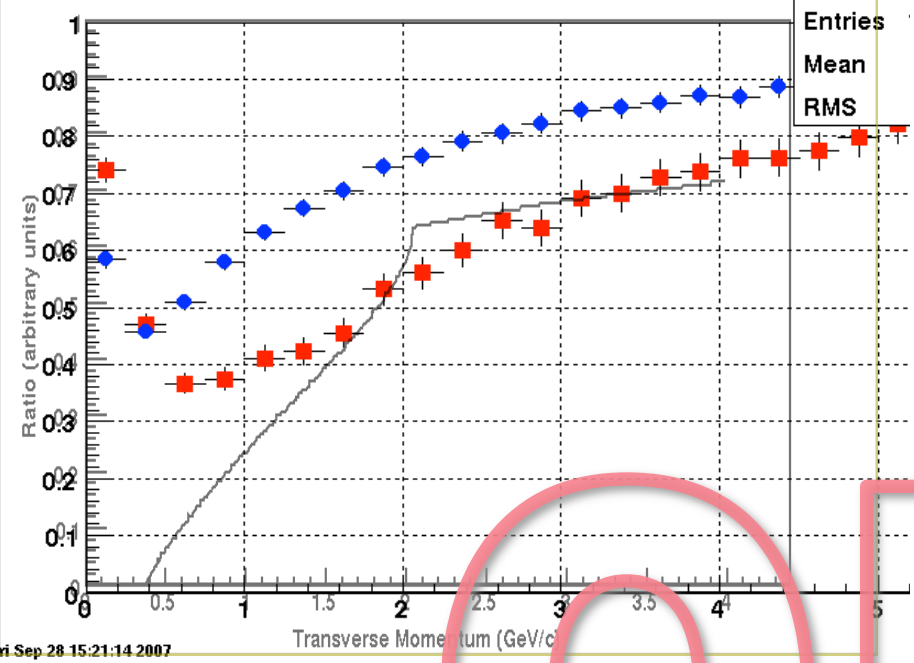
Fri Sep 28 15:21:14 2007

This is **Fig. 1** in H W note (right plot). It is a ratio plot of:
 All D0s with daughter (K,pi) momentum ≥ 0.8 GeV and $|\eta| \leq 1$ to
 All D0s with daughter $|\eta| \leq 1$

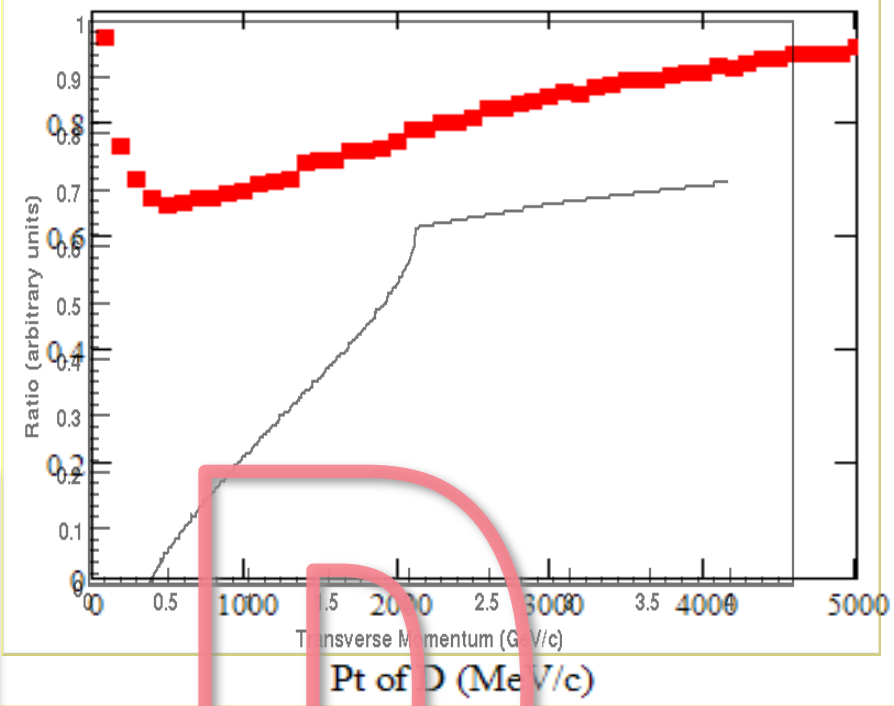
The **blue** dots on the left plot is the ratio plot w/out the $|\eta|$ cut imposed at all

The plots do not agree on the question ‘How much is lost by asking for $p > 0.8$ GeV on both daughters;’

Ratio of D0 cut vs D0 thrown .vs. Pt

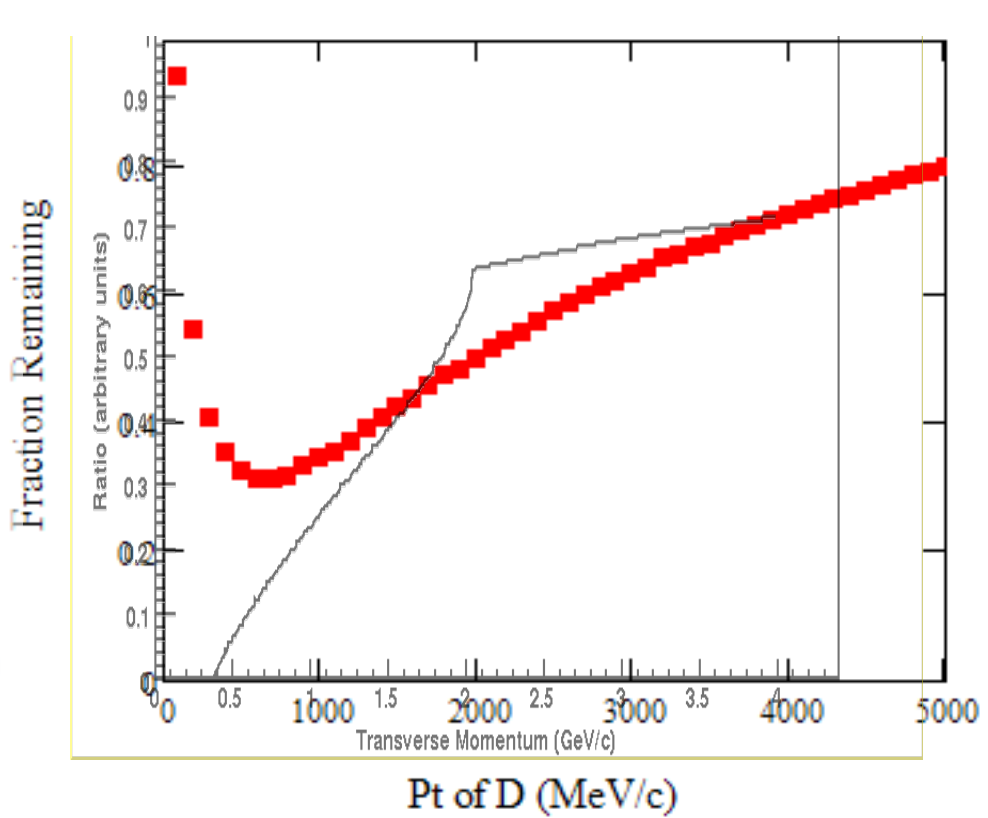
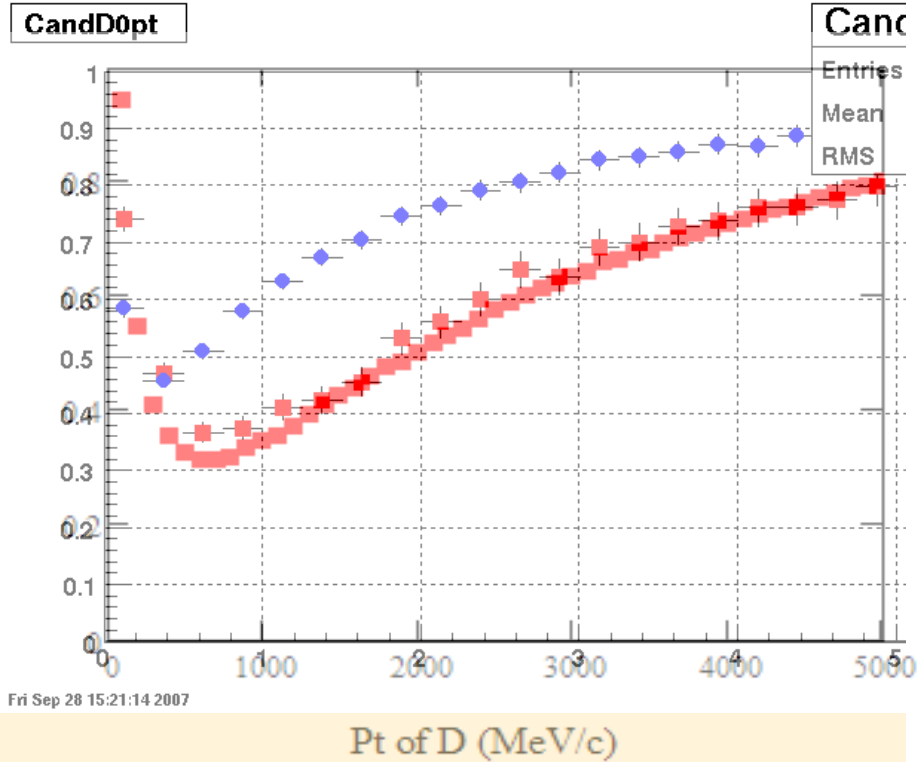


Ratio of D0 cut vs D0 thrown .vs. Pt

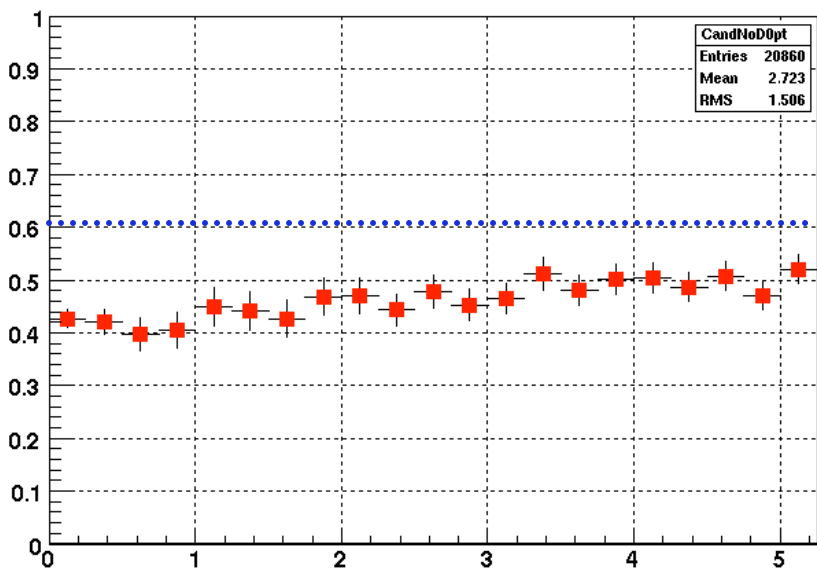


OLD

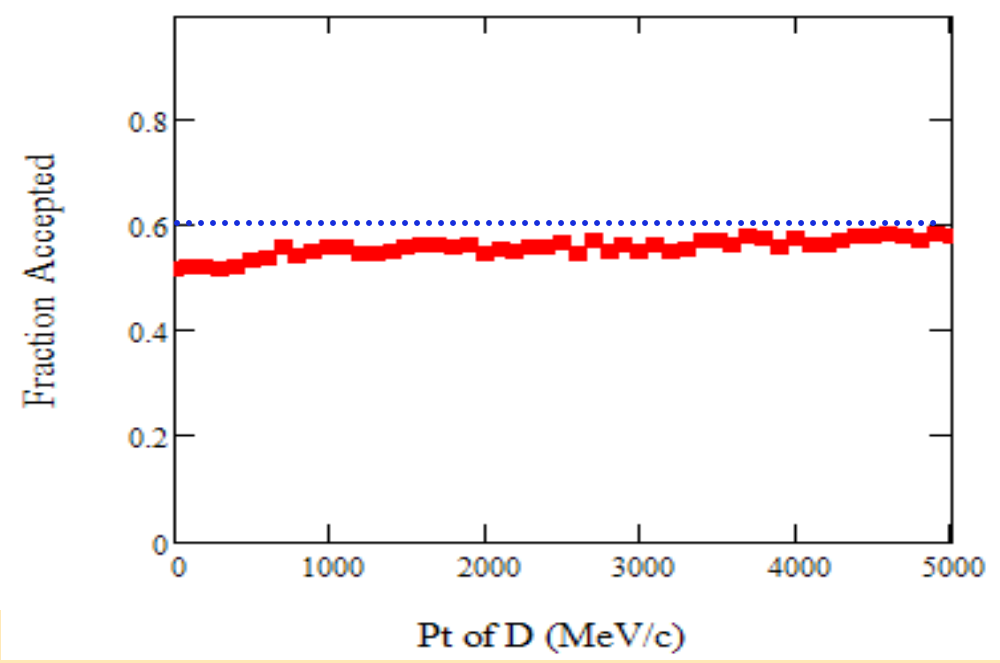
The solid black line is a hand(y) calculation by (guess)! Yes, Jim
 One difference is that his D0s are at eta=0 only, the rest is the same



Excellent agreement now



Fri Sep 28 15:13:10 2007



Fraction of D0s that daughters have $|\eta| \leq 1$ and $p \geq 0.8 \text{ GeV}$ and are intercepted in the 'detector'.

My detector

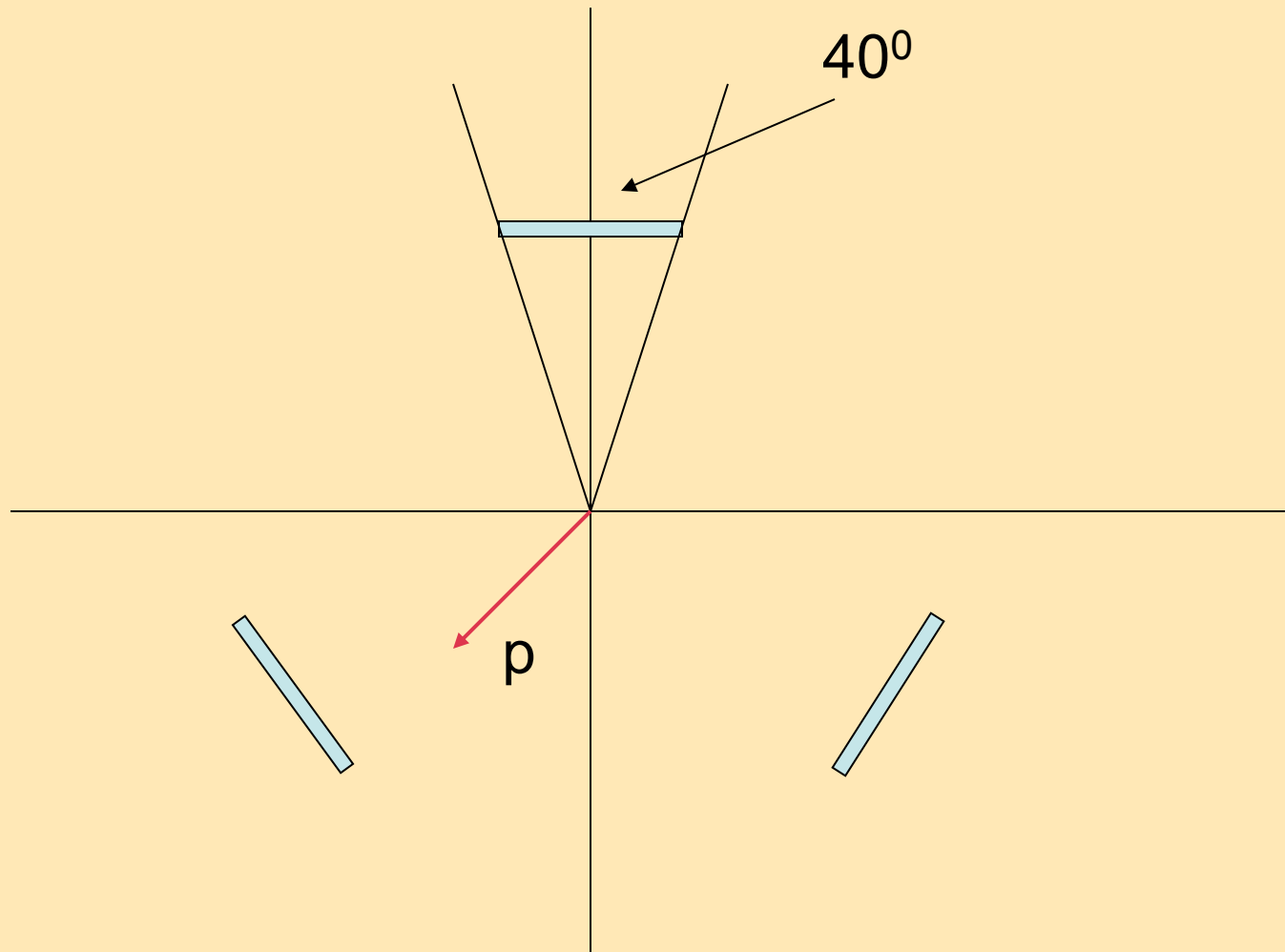
- UPGR13 geometry AND daughters must also have
- ≥ 10 TPC hits
- NPixHits ≥ 2
- 'particles decay'

HW detector

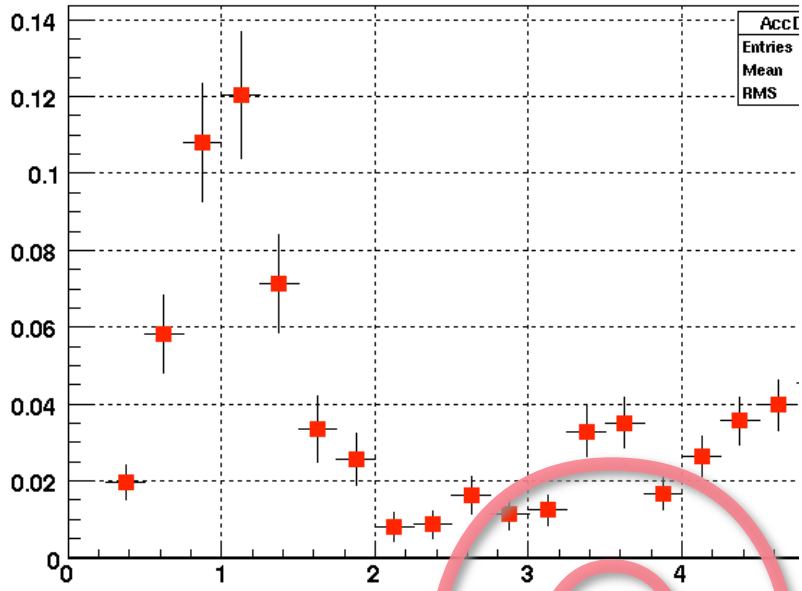
- Single Cylindrical surface at 8 cm radius only (same z coverage)

Good agreement given the slight differences

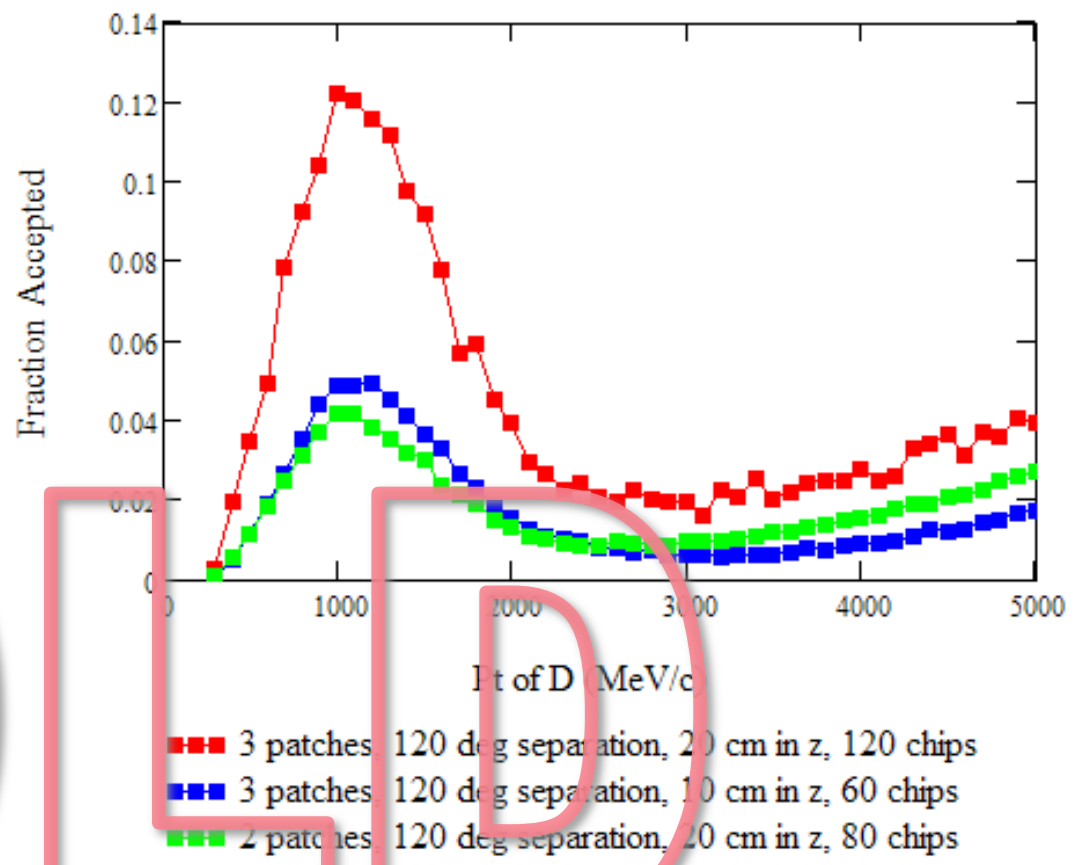
3-patch Pixel simulation, each covering 40 degrees



If the emission momentum vector of a daughter track falls in any angular cut then it is assumed as hitting the Pixels. Particle decays are included



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O

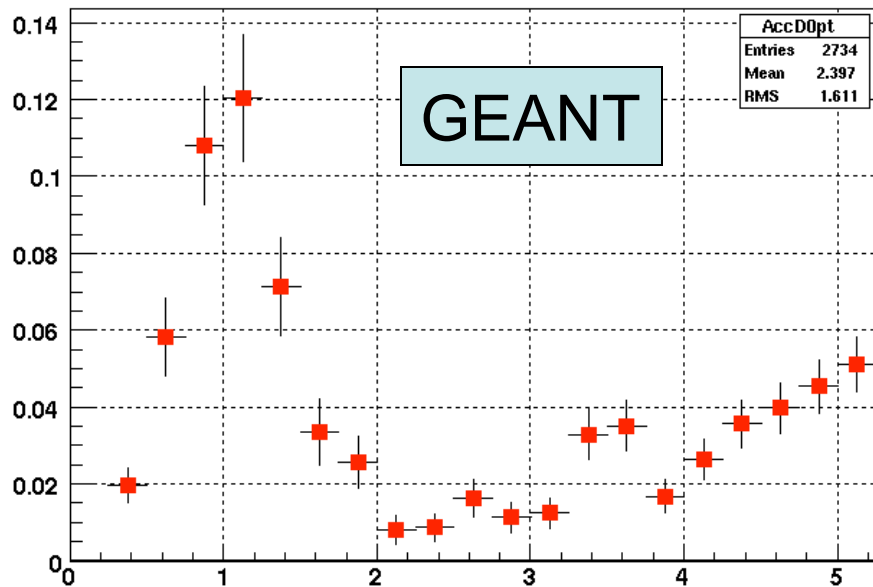
D

Ratio of:

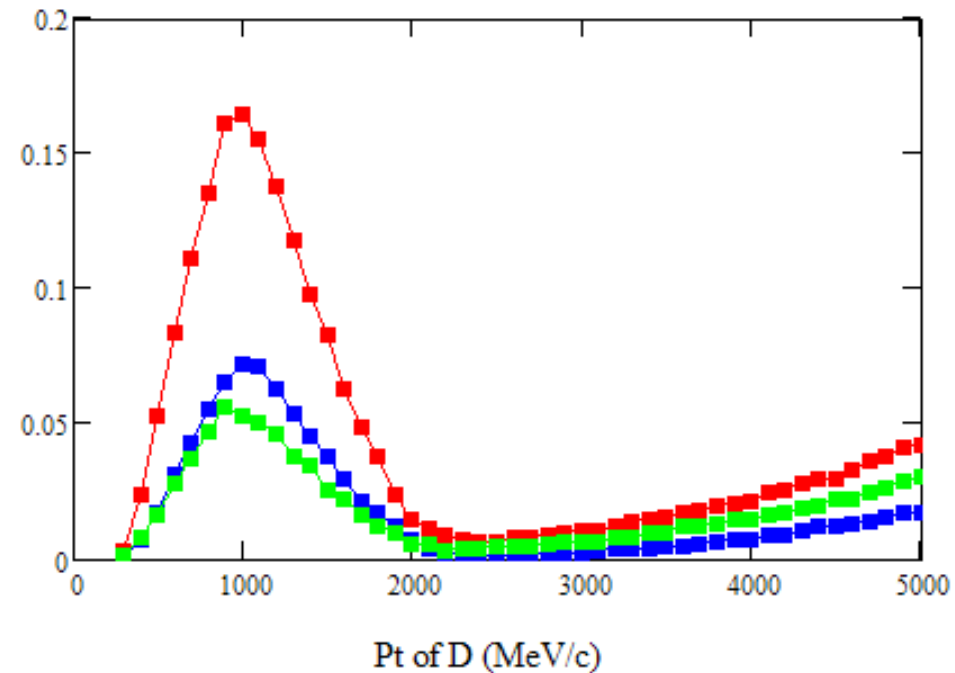
‘All D0s with daughters that hit the patches’ to
 ‘All D0s with daughters in $[\eta \leq 1 \text{ and } p > 0.8]$ ’

Remarkable agreement since on the left we have included particle decays, TPC sector gaps and extra (# of hits) requirements

AccD0pt



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- 3 patches, 120 deg separation, 20 cm in z, 120 chips
- 3 patches, 120 deg separation, 10 cm in z, 60 chips
- 2 patches, 120 deg separation, 20 cm in z, 80 chips

Ratio of:

‘All D0s with daughters that hit the patches’ to
‘All D0s with daughters in $[\eta \leq 1 \text{ and } p > 0.8]$ ’

Remarkable agreement given that on the left we have included particle decays, TPC sector gaps and extra (# of hits) requirements