

Geometrical efficiencies of a patch Pixel detector via GEANT

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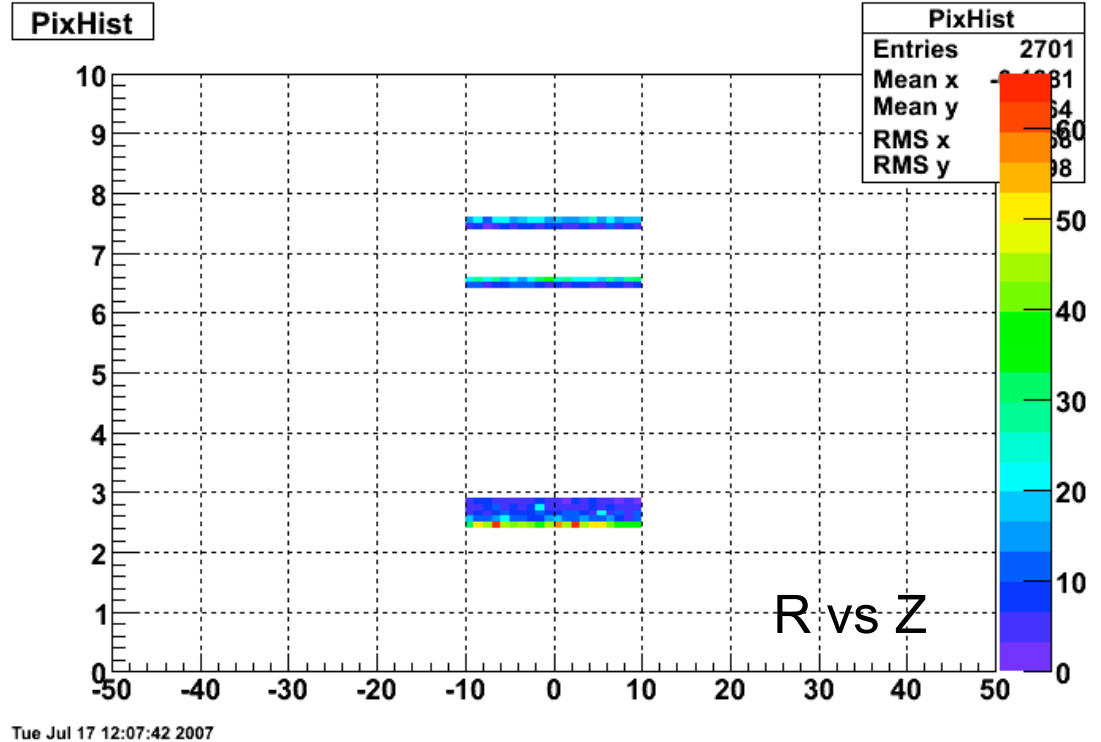
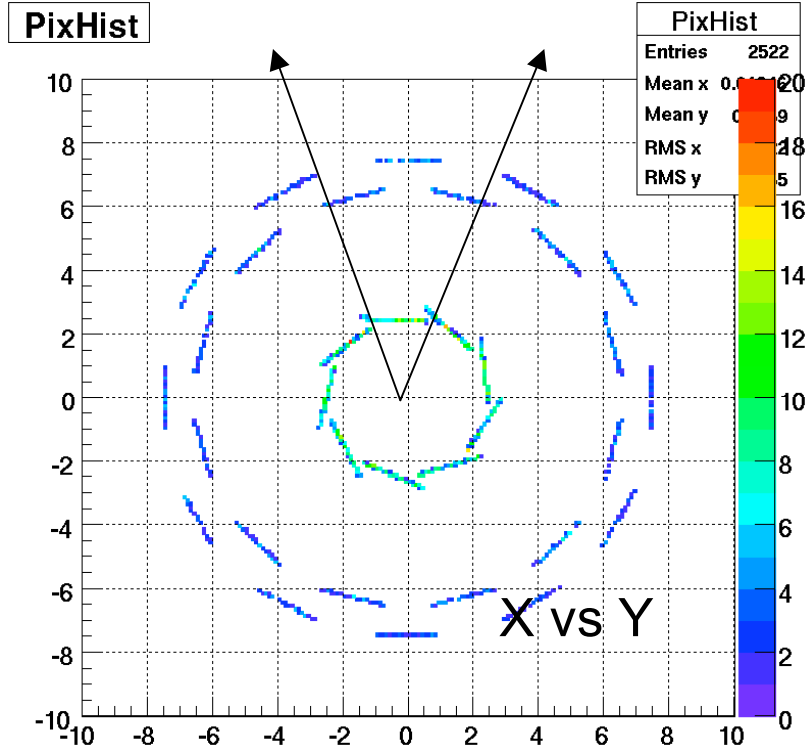
Original note based on a MathCAD simulation by H.Wieman
http://www-rnc.lbl.gov/~wieman/D_efficiency.htm and
http://www-rnc.lbl.gov/~wieman:D_efficiency_2.htm

Input data used

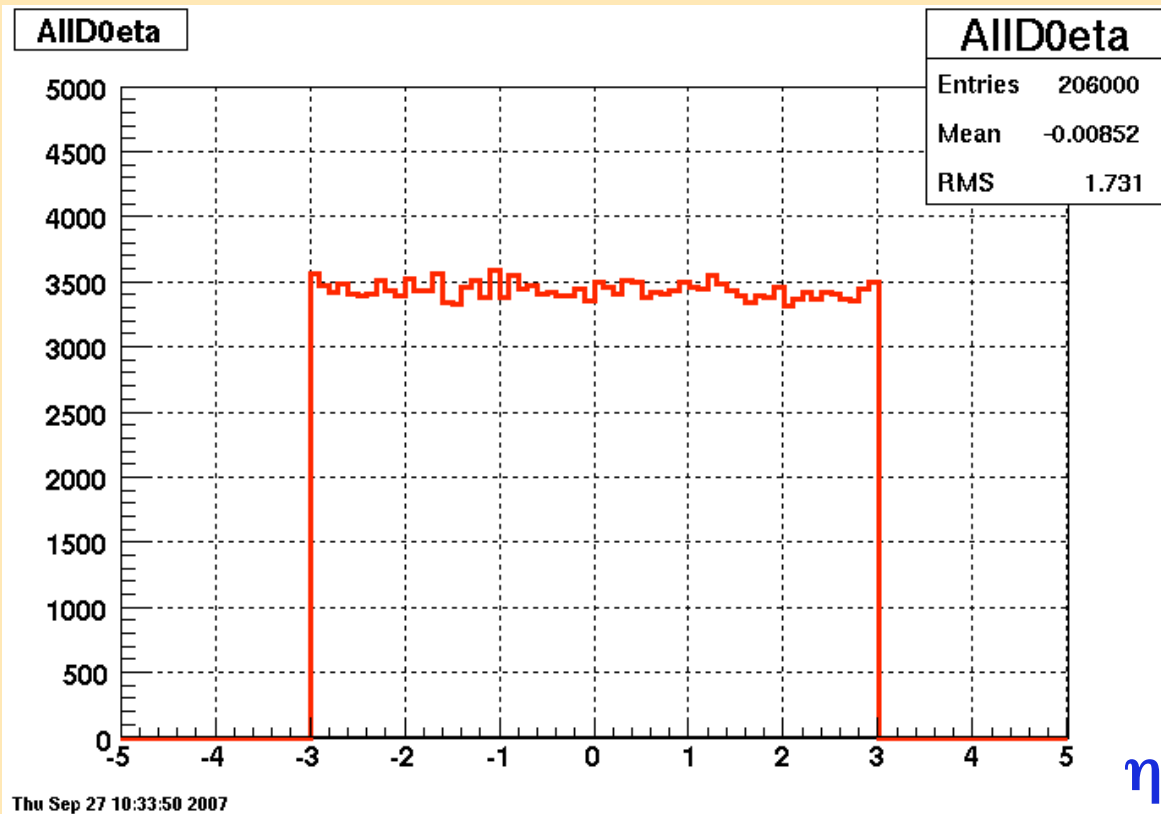
We used 'data' from our own production using the UPGR13 geometry to best match Howard's input

Sept 28, 2007

UPGR13 GEOMETRY

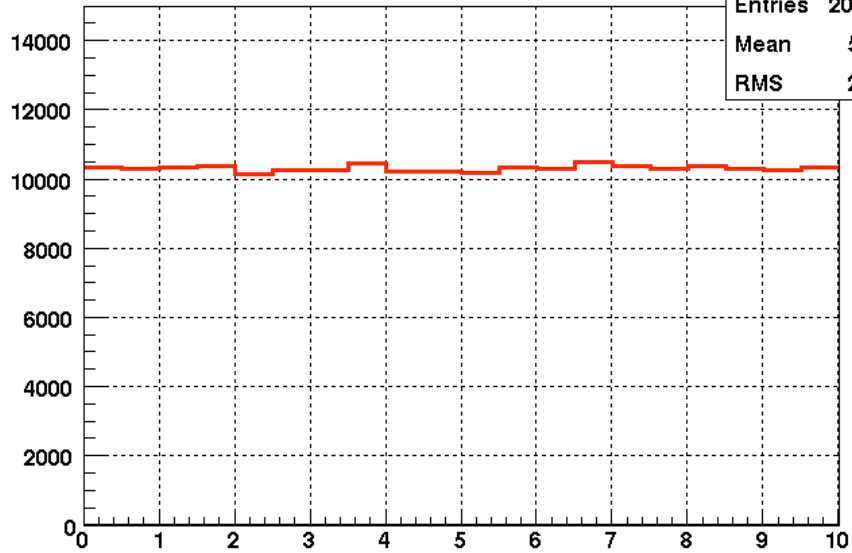


- Detector hits look fine
- Extends to $|z| \leq 10$ cm
- One Inner ladder covers 40 degrees in Phi



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

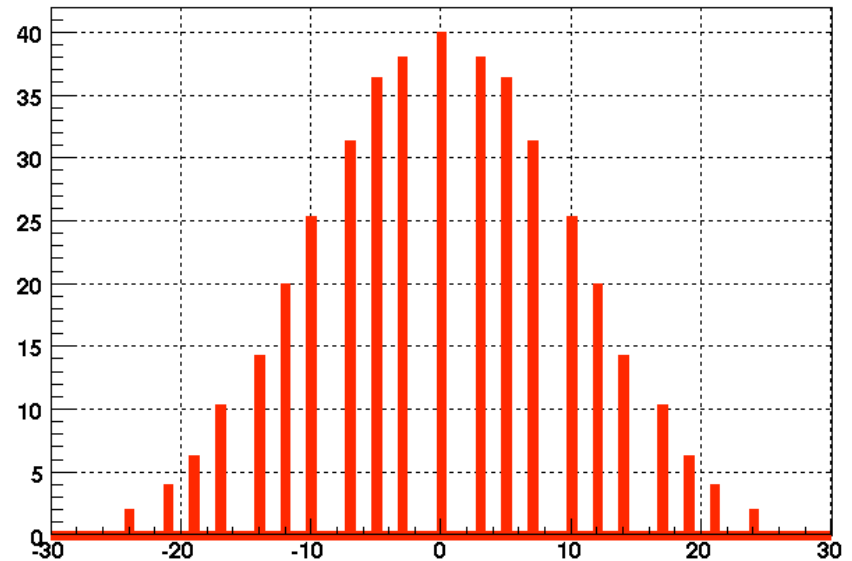
AlID0pt



AlID0pt
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

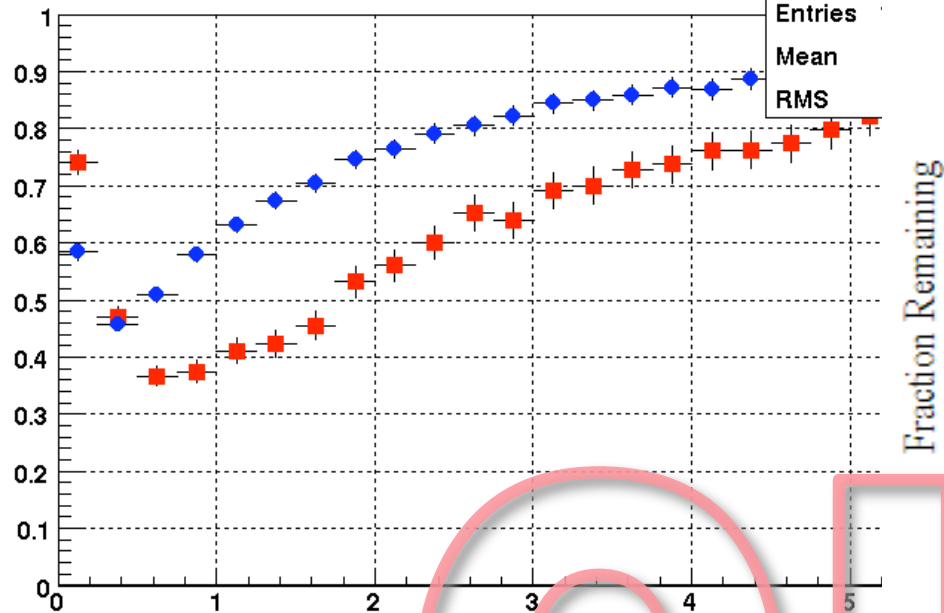
CandD0pt

Cand2D0pt

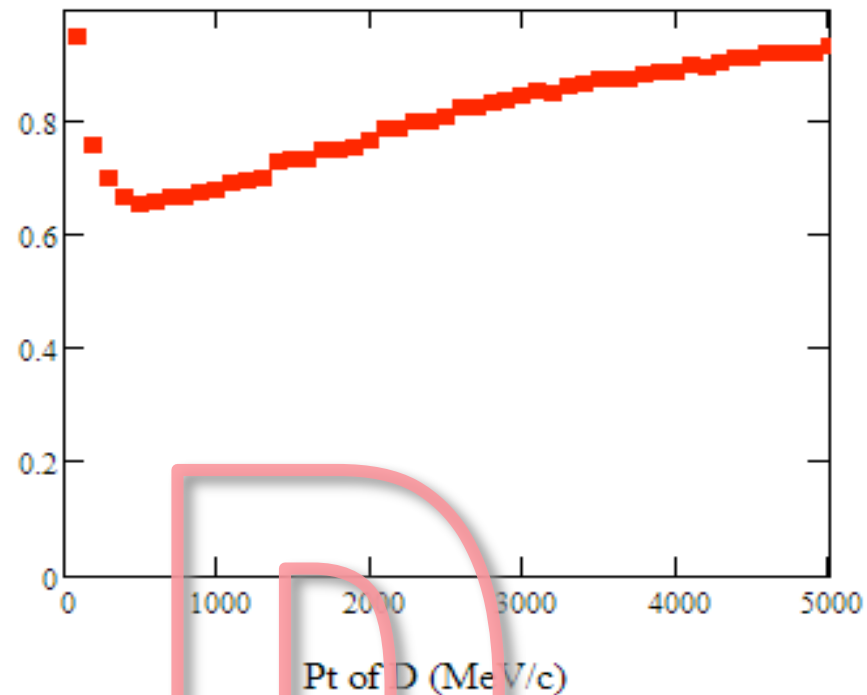
Entries

Mean

RMS



Fraction Remaining



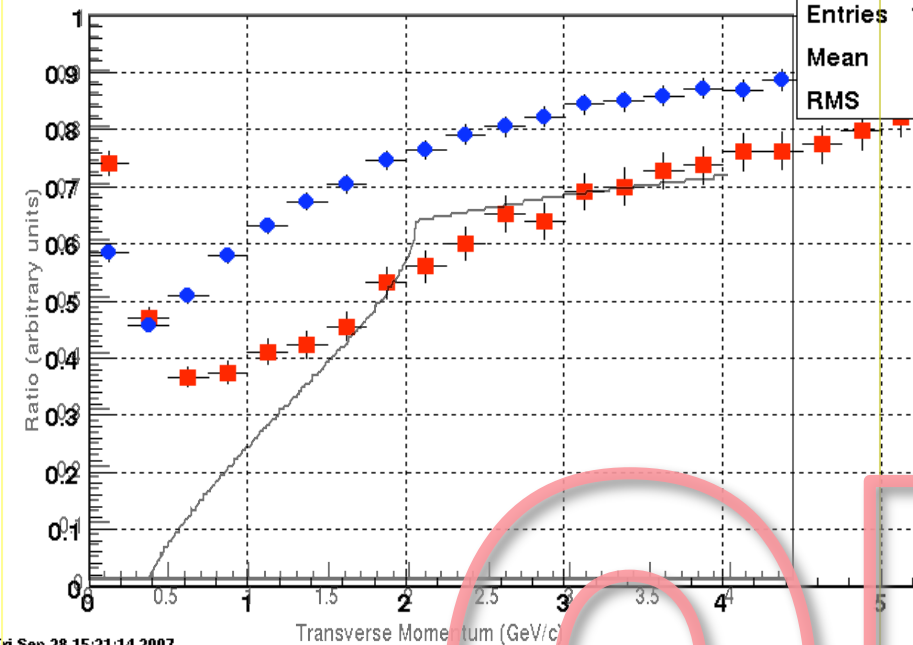
Fri Sep 28 15:21:14 2007

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

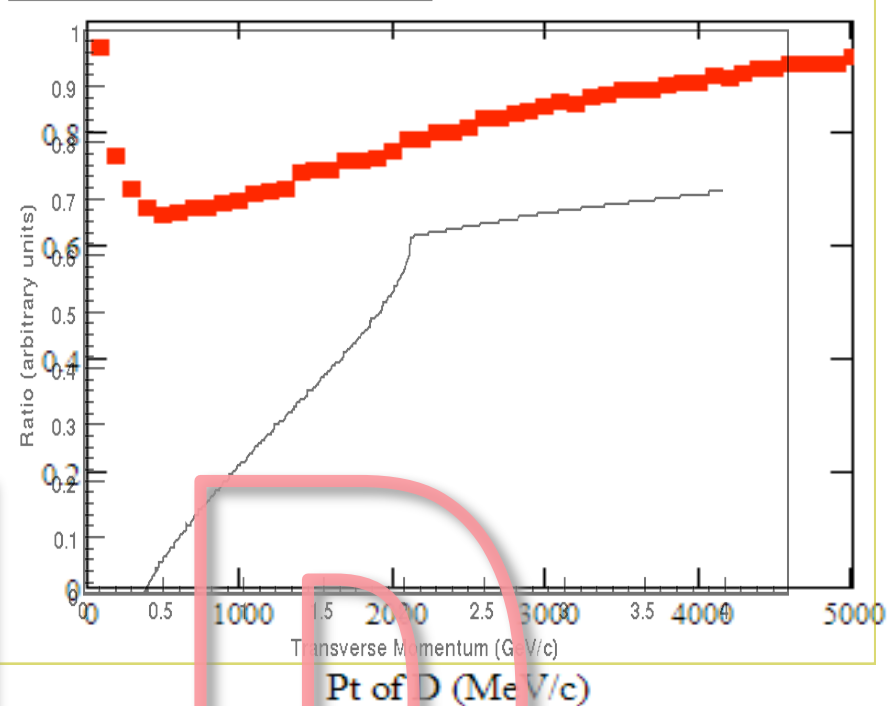
The plots do not agree on the question ‘How much is lost by asking for $p > 0.8$ GeV on both daughters;’

Ratio of D0 cut vs D0 thrown .vs. Pt



Cand2D0pt

Ratio of D0 cut vs D0 thrown .vs. Pt



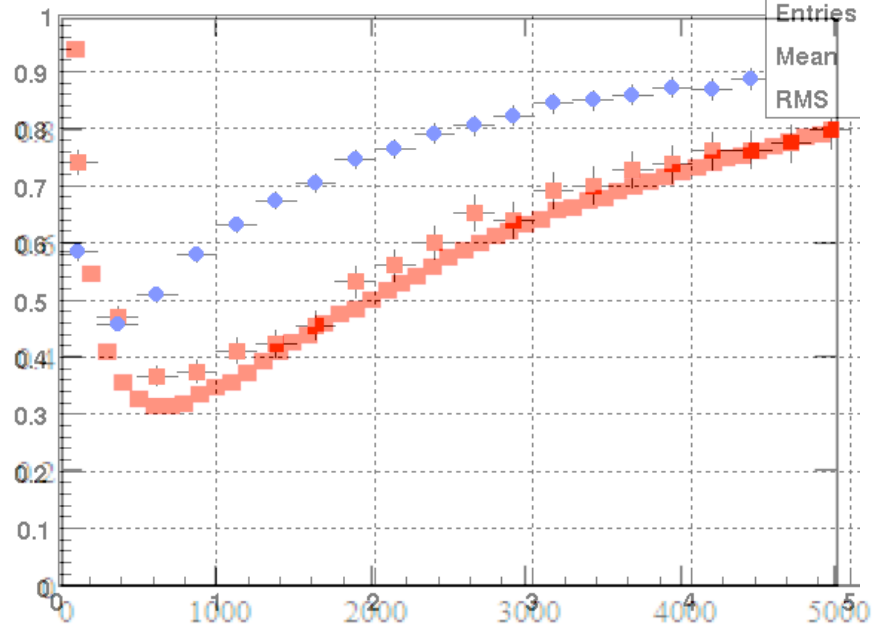
D0

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

CandD0pt

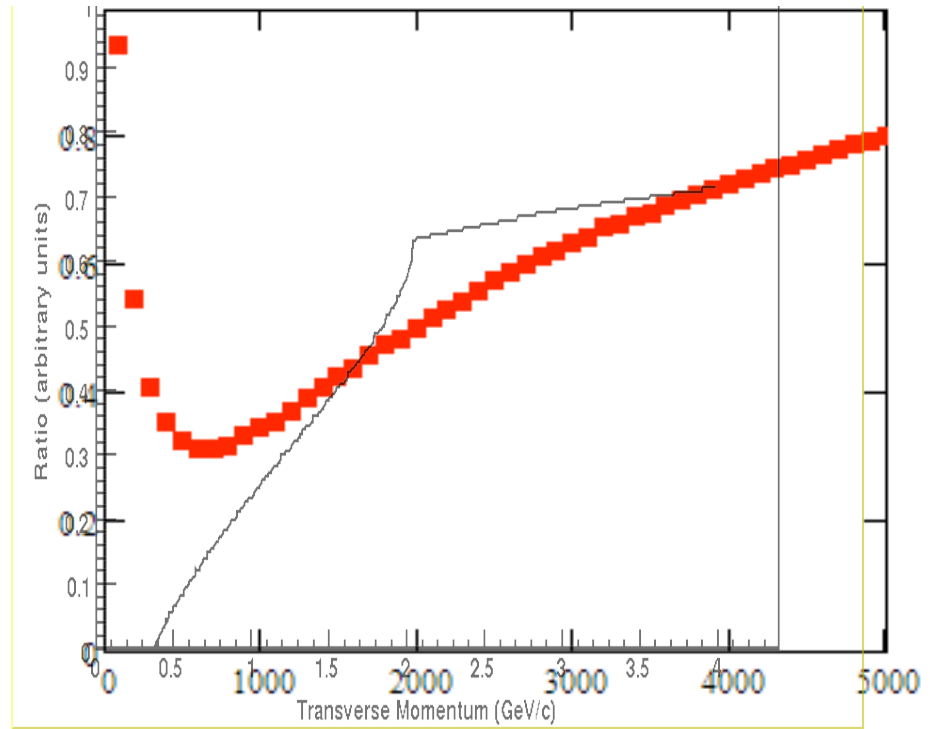
CandD0pt

Entries
Mean
RMS



Fri Sep 28 15:21:14 2007

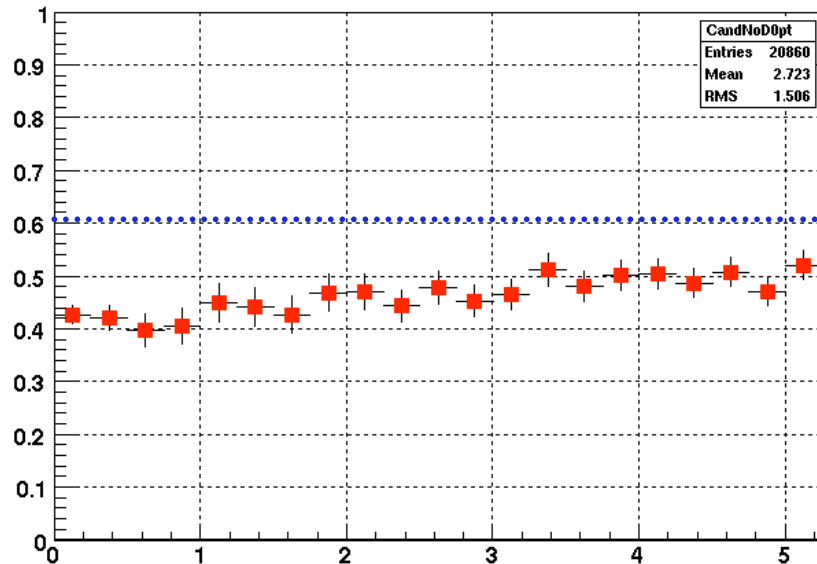
Fraction Remaining



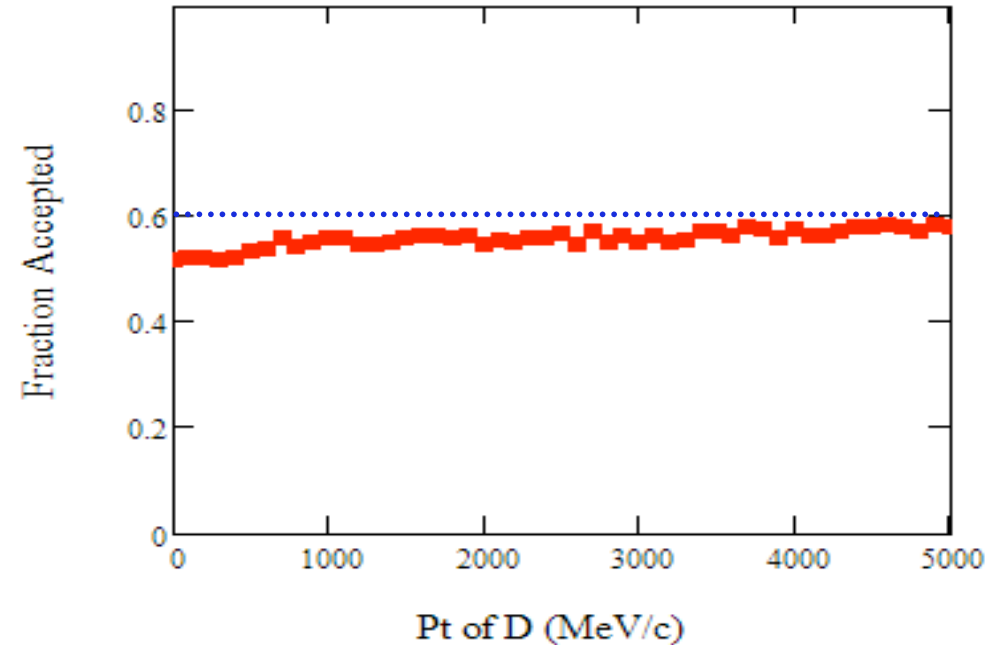
Pt of D (MeV/c)

Excellent agreement now

CandNoD0pt



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

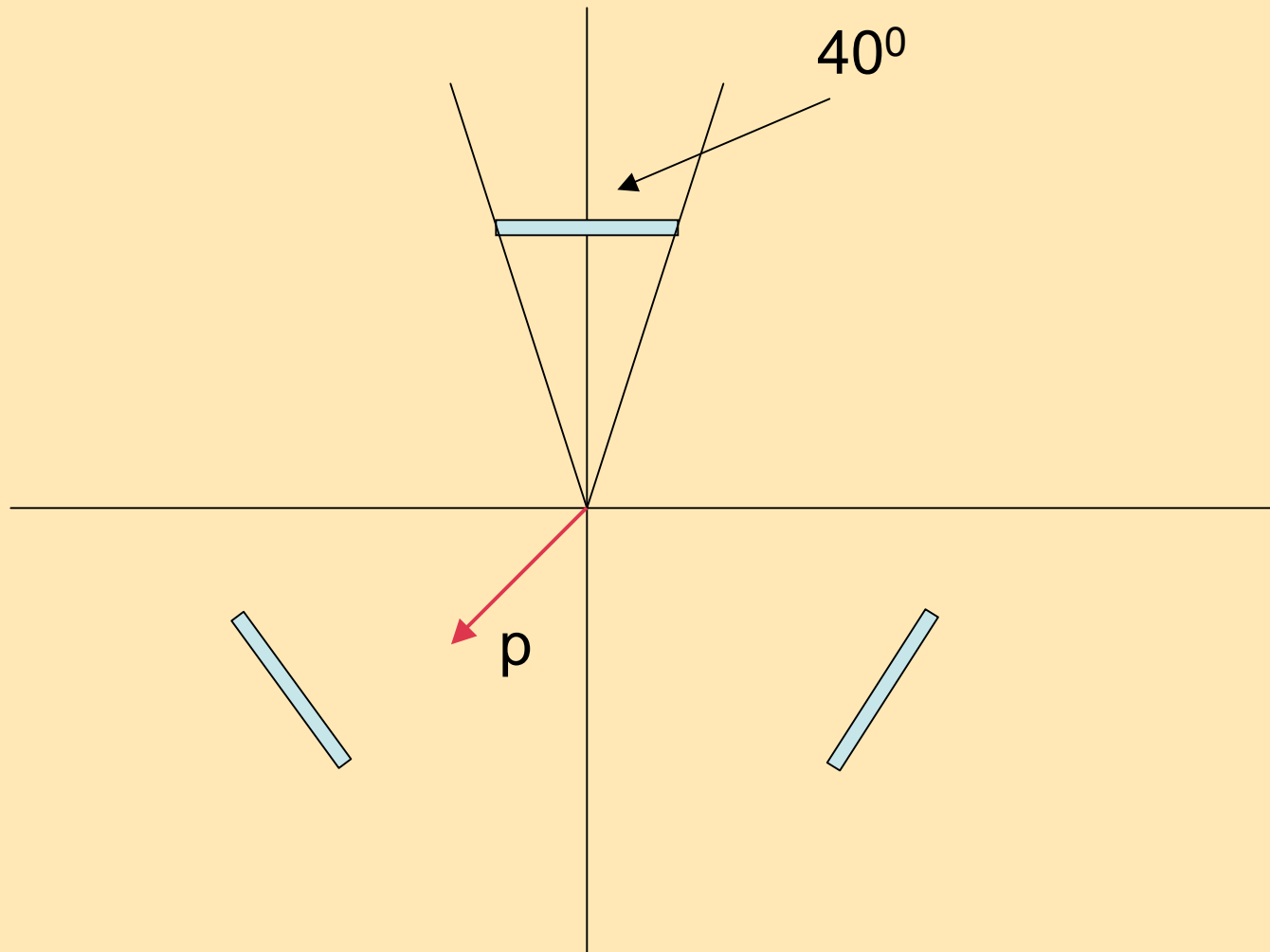
- UGR13 geometry AND daughters must also have
- ≥ 10 TPC hits
- NPixHits ≥ 2
- 'particles decay'

HW detector

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

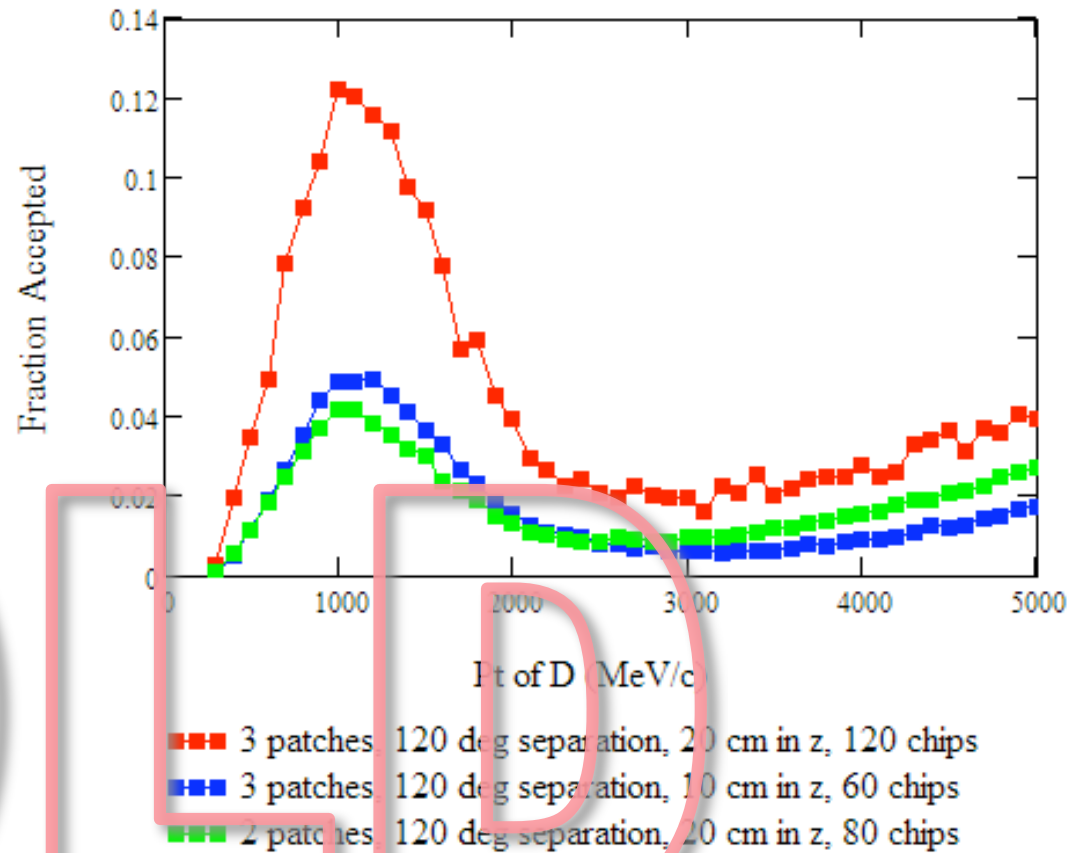
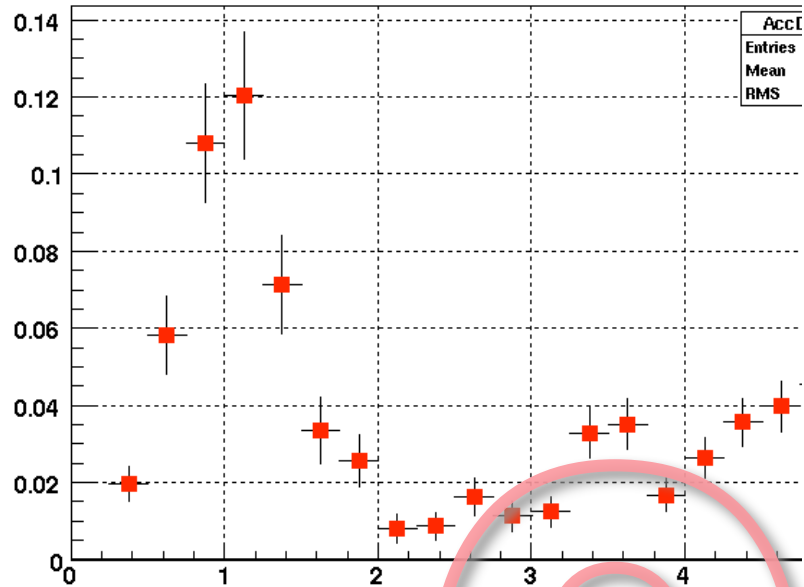
Good agreement given the slight differences

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

AccD0pt



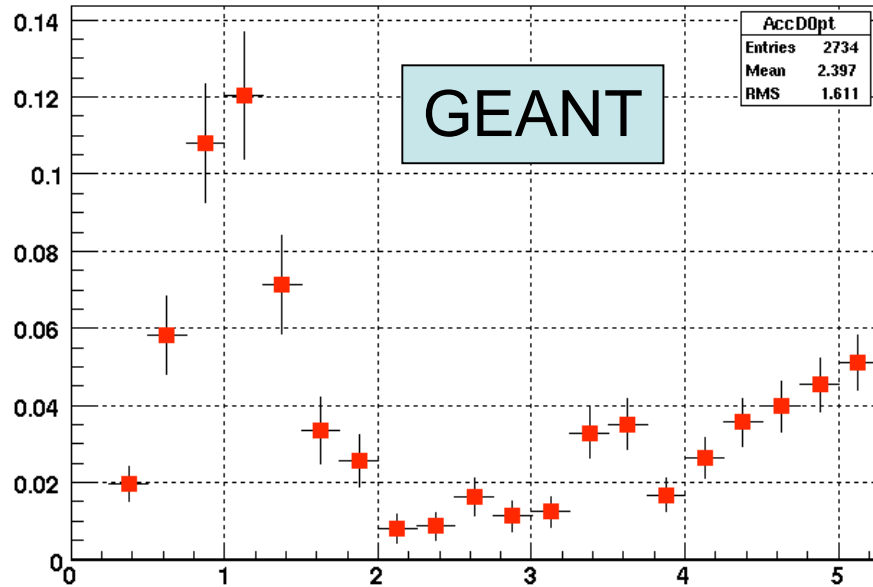
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Ratio of:

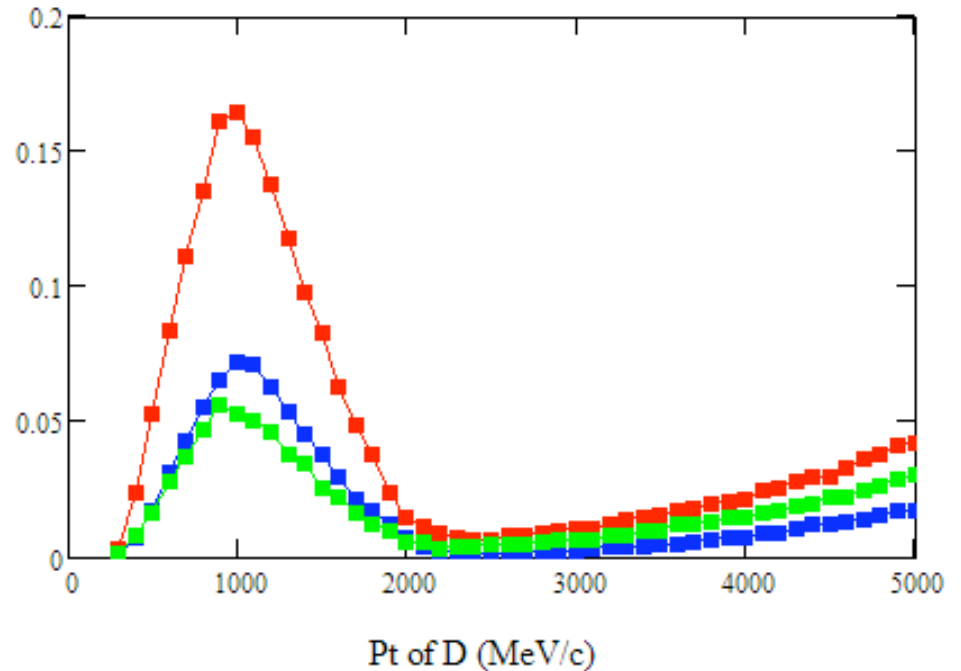
‘All D0s with daughters that hit the patches’ to
‘All D0s with daughters in $[\eta \leq 1 \text{ and } p > 0.8]$ ’

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

AccD0pt



Fri Sep 28 15:15:37 2007



- 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 [$\eta \leq 1$ and $p > 0.8$]’

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