EVO Meeting 2012-10-30

- Agenda
  - First Approach to Pattern Recognition for FTS
  - Status Report on X(3872) Simulations
    (for study of FTS)

First Approach to Pattern Recognition for FTS

- Idea: Hough Transform of parabola (as in "Tracking in the Silicon Tracker System of the CBM Experiment using Hough Transform" by Gläß, Steinle, Männer, Univ. of Mannheim)

- Pro

  - Can be used with inhomogeneous magnetic fields

  - robustness against noisy, missing or additional detector hits

  - operations per event proportional to number of detector hits

  - Suited for implementation on FPGA

- Con

  - Parabola shape of particle tracks with fixed apex is assumed (in x-z-plane, straight line in y-z-plane)

  - Simulation shows that particles arrive at dipole field with considerable axial distance to beampipe (Probably the method has to be adjusted)

First Approach to Pattern Recognition for FTS

In the x-z plane the approximated parabola is:

$$x = \frac{n\, e\, B_y}{2\, p_z} z^2 \tag{1}$$

where n is the number of elementary charges e, p_z the z component of the momentum and B_y the y component of the magnetic field. In case of an inhomogenous magnetic field B_y may be any function of the hit coordinates x and z. For tracks starting with an angle $\theta = \arctan p_x/p_z$, $x \to z\sin\theta - x\cos\theta$ and $z \to z\cos\theta + x\sin\theta$ and thus

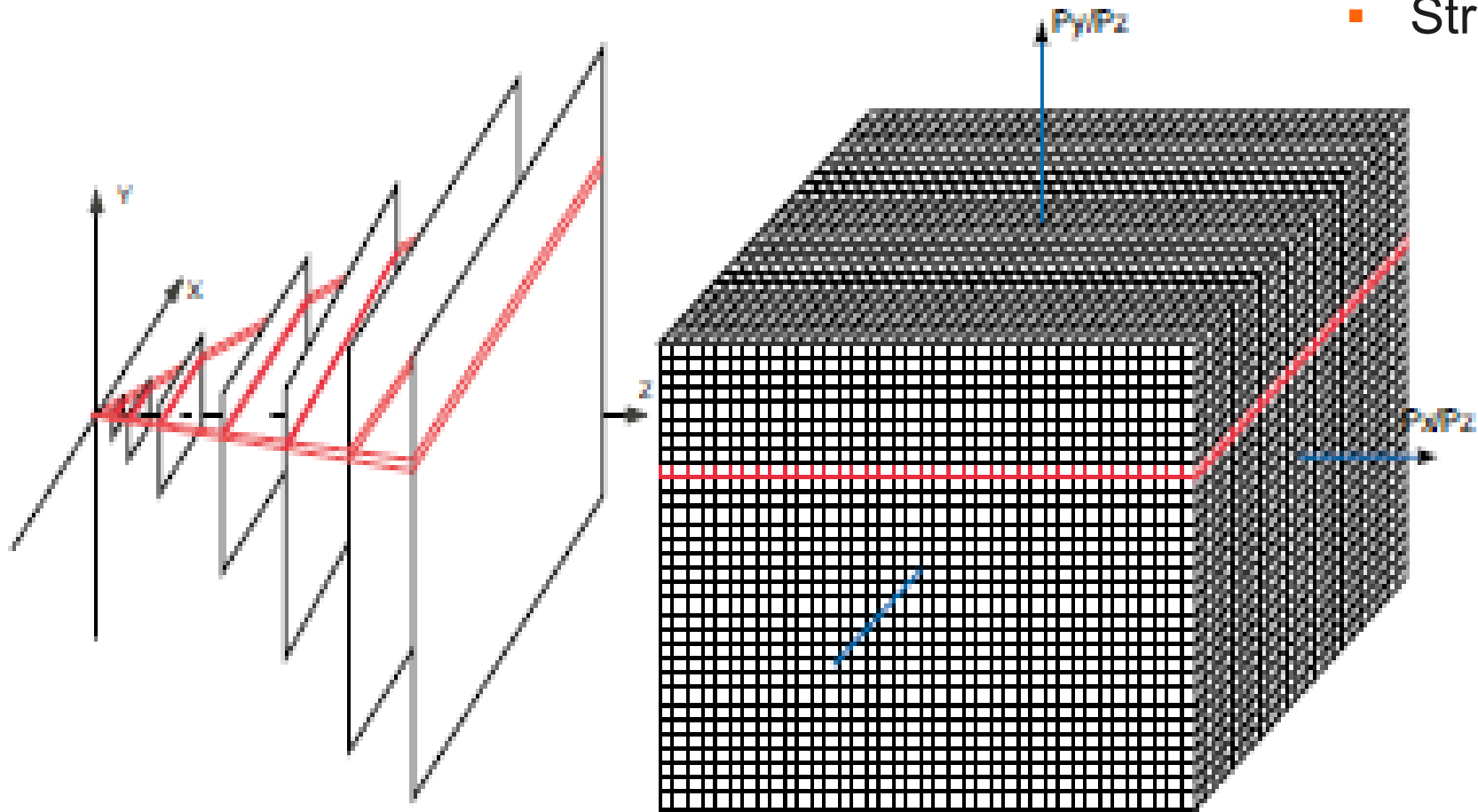$$\frac{1}{p_z} = \frac{2\,(z\sin\theta - x\cos\theta)}{ne\,B_y\,(z\cos\theta + x\sin\theta)^2} \tag{2}$$

Principle

- In x-z-plane:
- Parabola
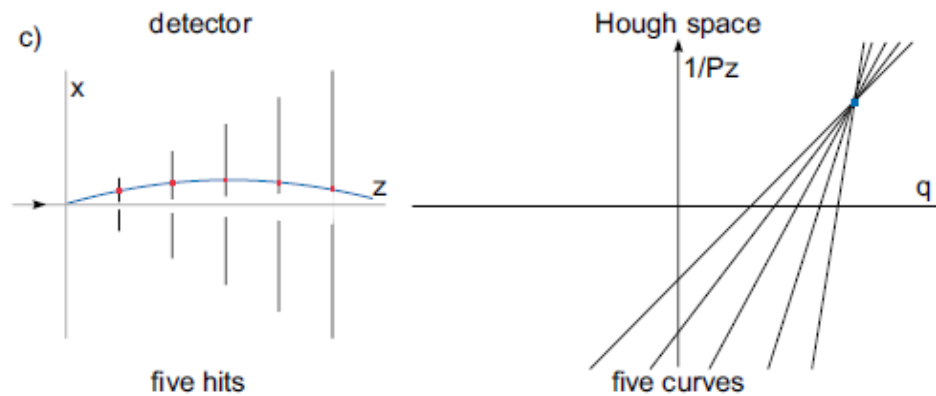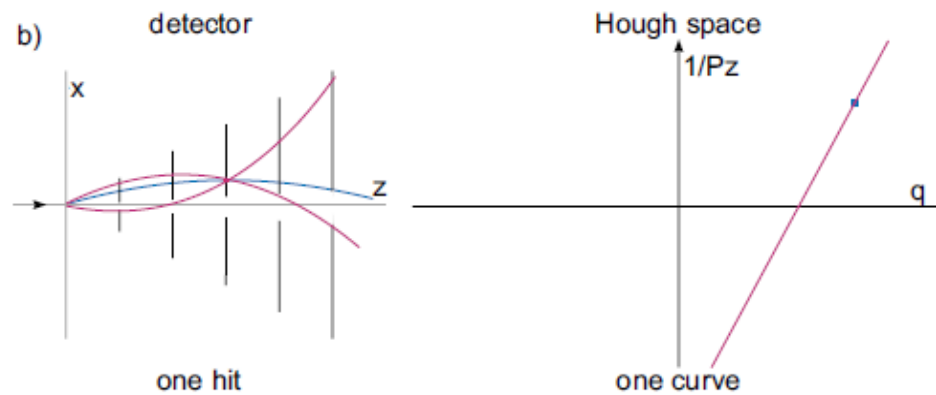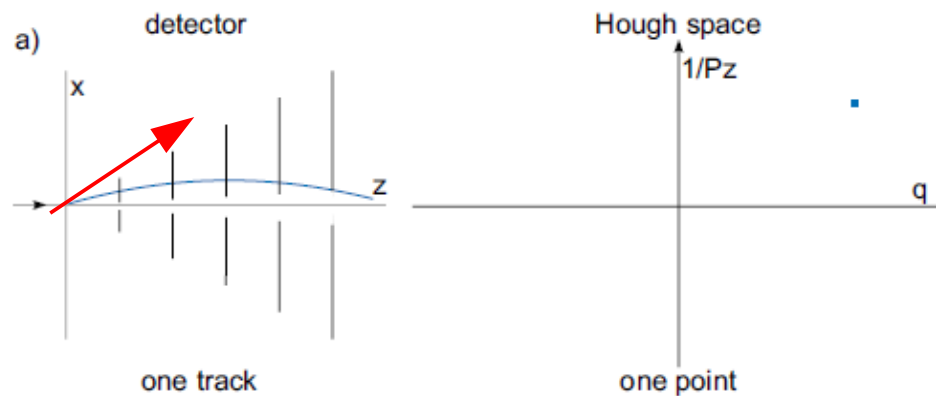
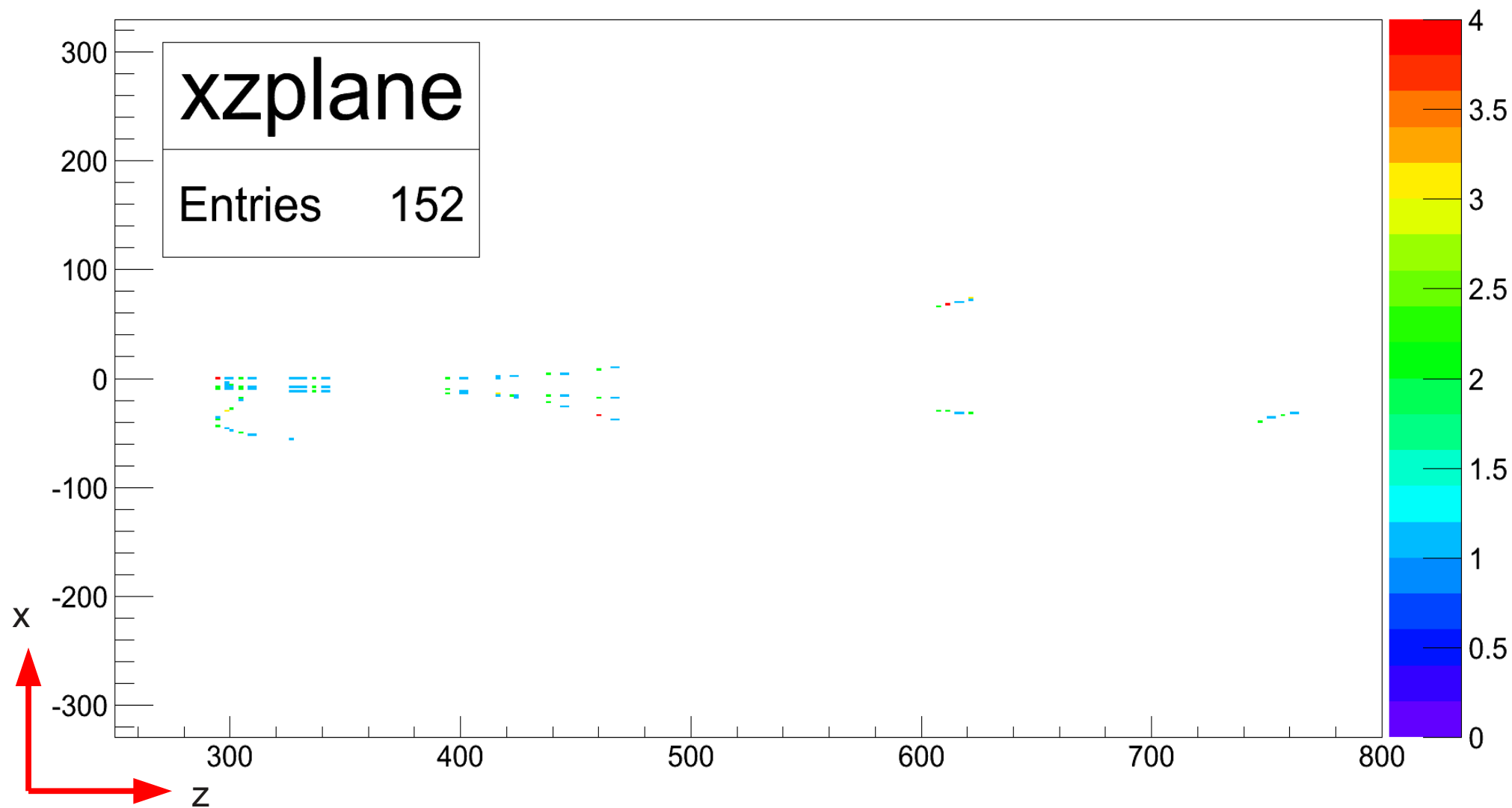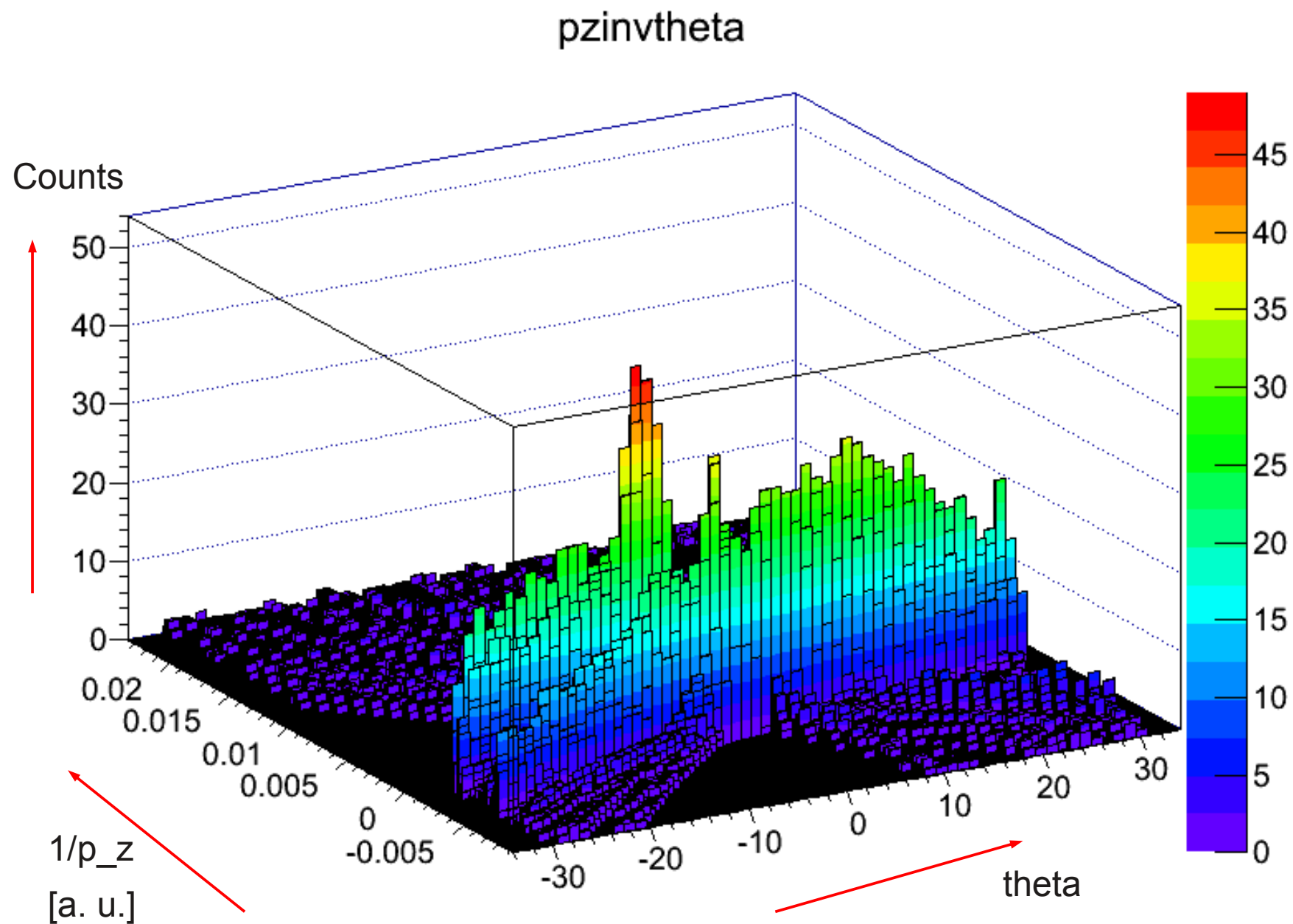# Principle

- In y-z-plane:
- Straight line

First Tests

xzplane

First Tests

pzinvtheta
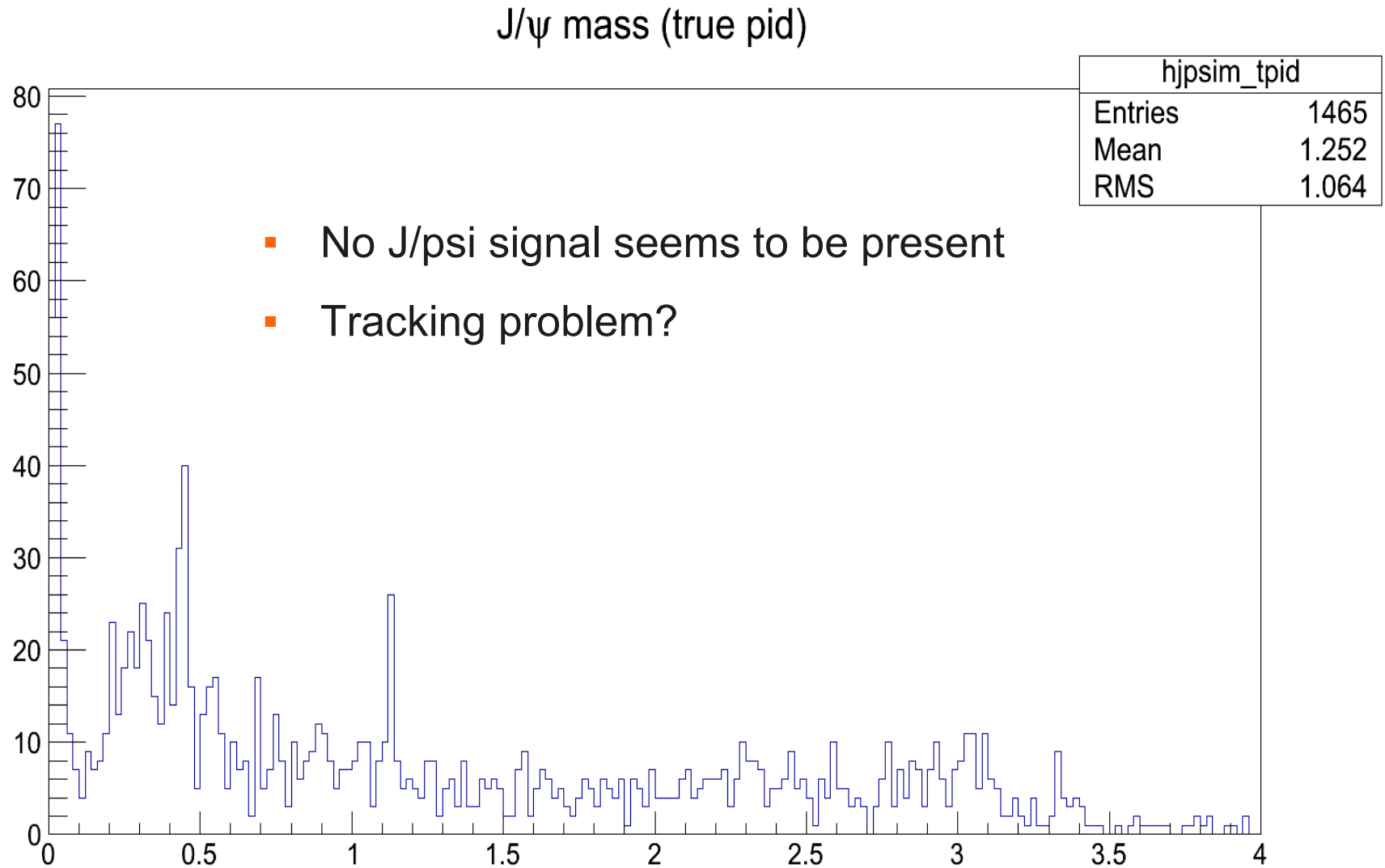
Counts

1/p_z [a. u.]

theta

X(3872) Simulations for FTS Study
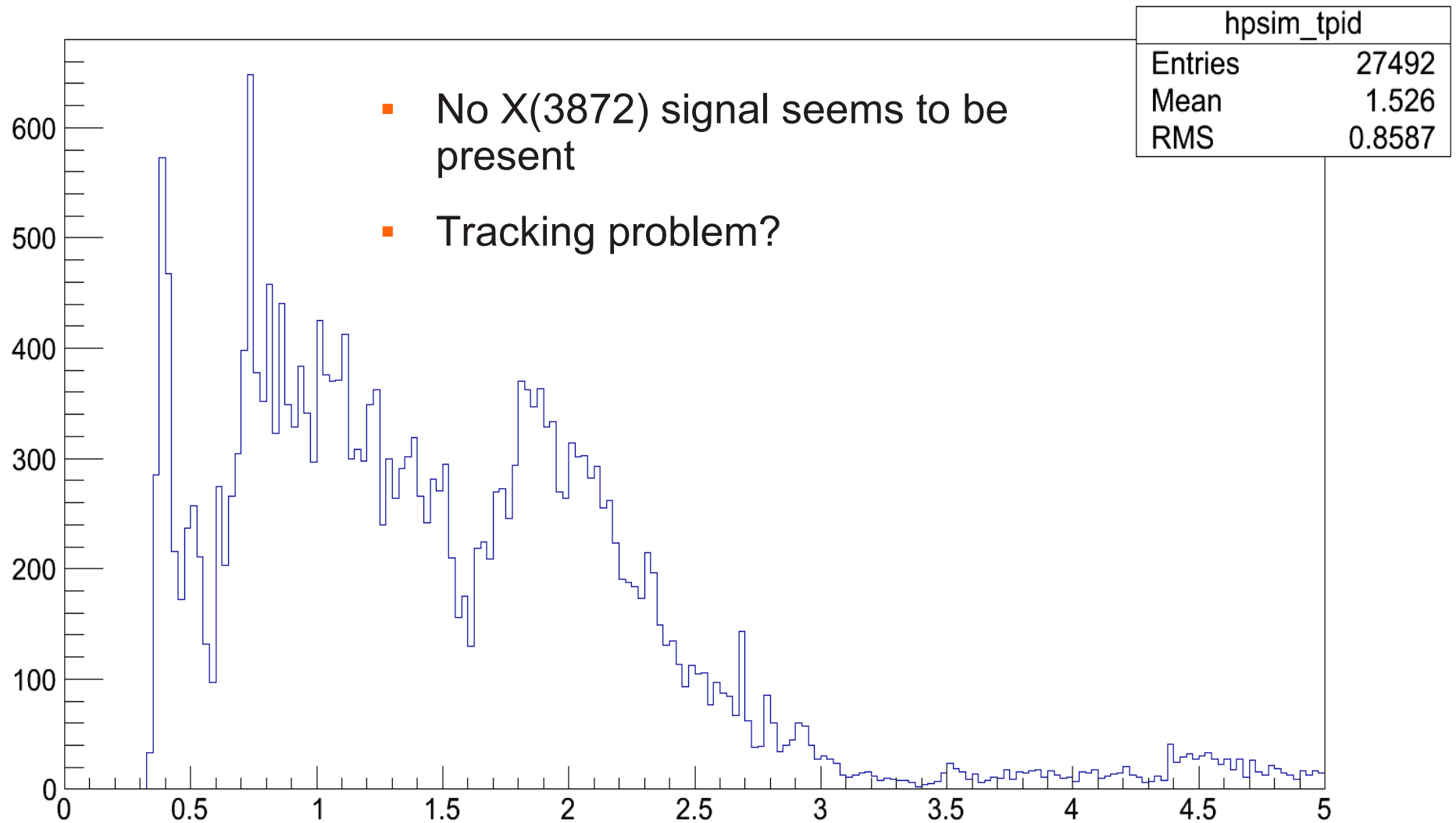
X(3872) Simulations for FTS Study

- Goal: Compare results with and without FTS

- Status: There is some problem

- Used PandaRoot Revision 17558

- Official macros from macro/run with new stt+mvd code
(DIRC commented out)

- Analysis macro from tutorial/feb12
(running compiled for speed)

- X(3872) $\rightarrow$ J/psi pi+ pi- (with fixed VVPiPi)

- J/psi $\rightarrow$ e+ e- (with VLL)

- Unfortunately, forgot "noPhotos" in decay file
(running again with noPhotos)

- 1000 signal events with PndEvtGenDirect

Some plots with MC Truth PID...

J/ψ mass (true pid)

hjpsim_tpid	
Entries	1465
Mean	1.252
RMS	1.064

- No J/psi signal seems to be present
- Tracking problem?

Some plots with MC Truth PID...

X(3872) mass (true pid)

hpsim_tpid	
Entries	27492
Mean	1.526
RMS	0.8587

- No X(3872) signal seems to be present

- Tracking problem?

Some plots with MC Truth PID...

X(3872) mass (true pid)

- Zoomed in view

hpsim_tpid
Entries   27492
Integral   419
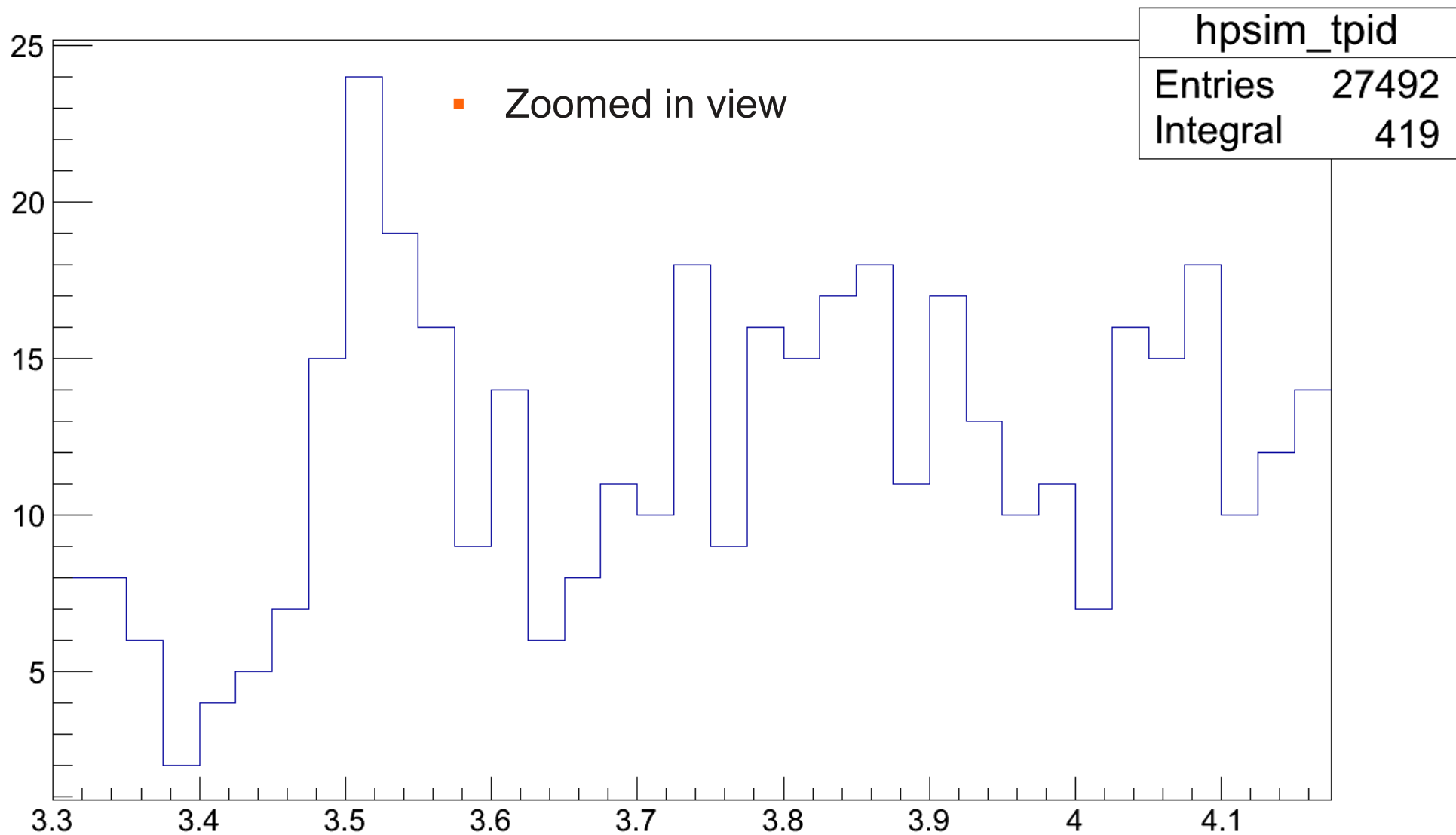
Summary

- Only little progress due to continued illness

- There is some problem in the analysis macro, the run macros or tracking?

- I am further investigating the problems and will post in the forum what I found

- Hough Transform was suggested and studied as possibility for FTS Pattern Recognition and will be further investigated

Thank you!