

An aerial photograph of a landscape with green fields and brown patches, with snow-capped mountains in the background. A yellow circular line with several small yellow circles at intervals is overlaid on the landscape, representing a beamline. The text is centered over the image.

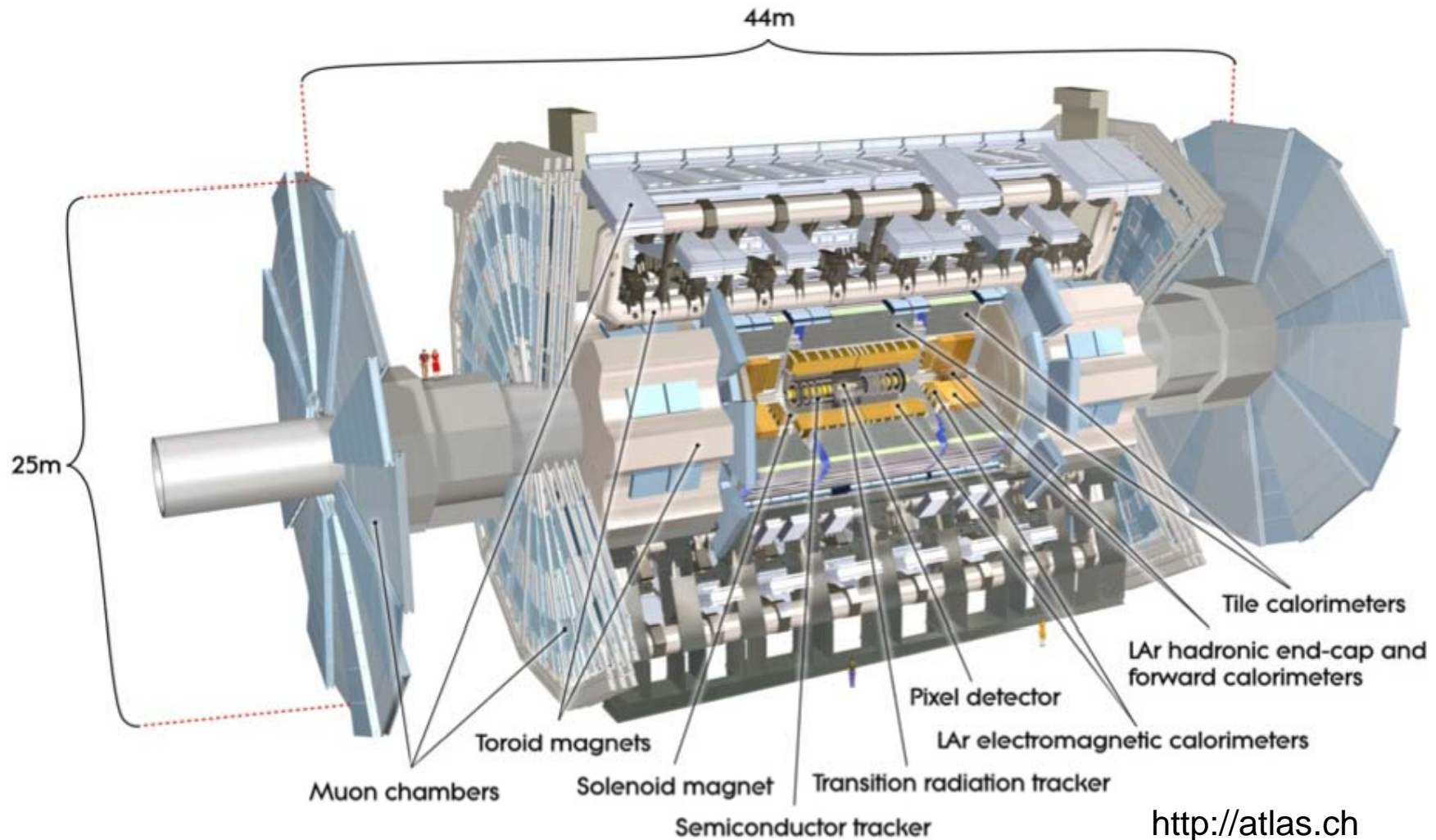
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**Project:**  
Beamline Position Measurements for the  
ATLAS Trigger System

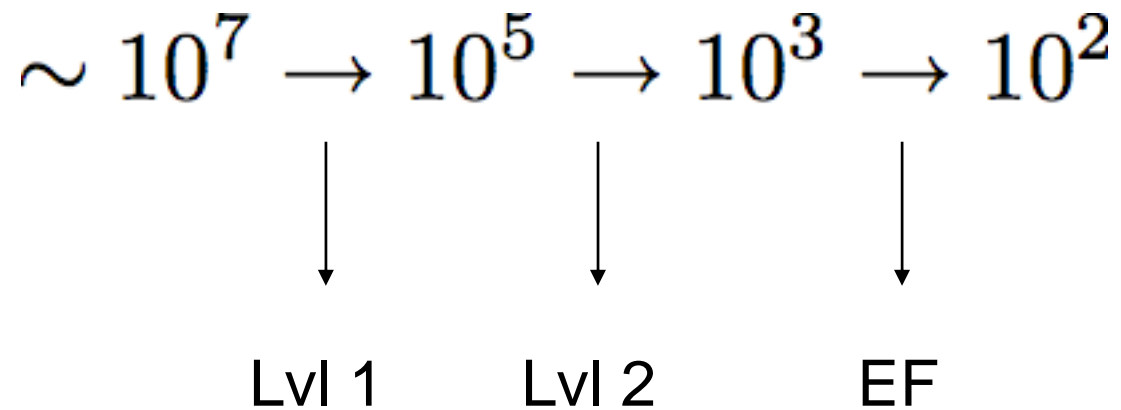
# ATLAS - A Toroidal LHC Apparatus



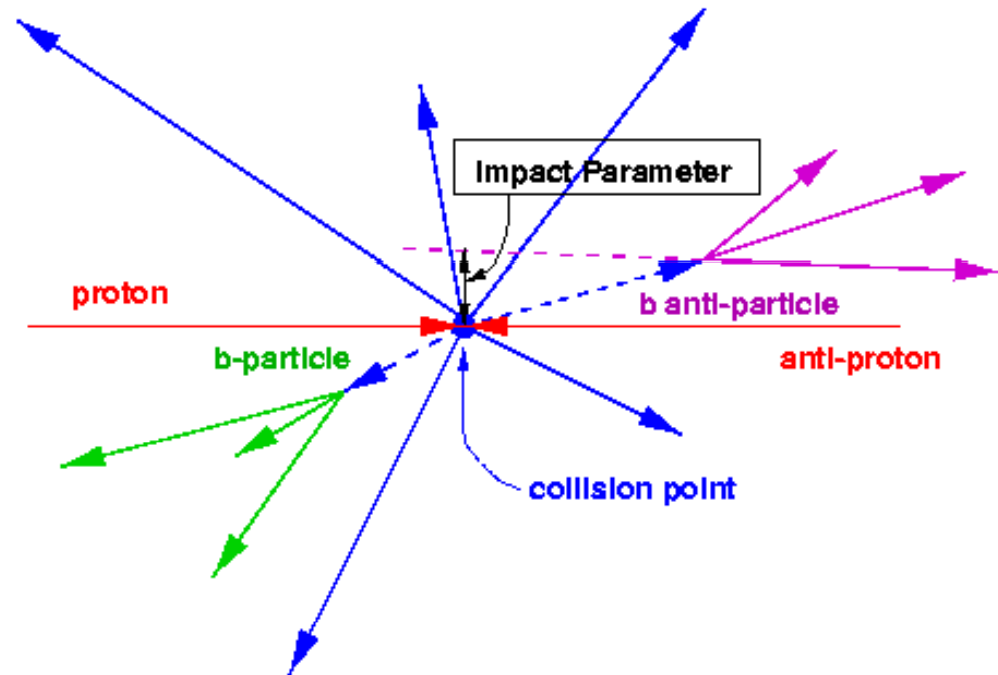
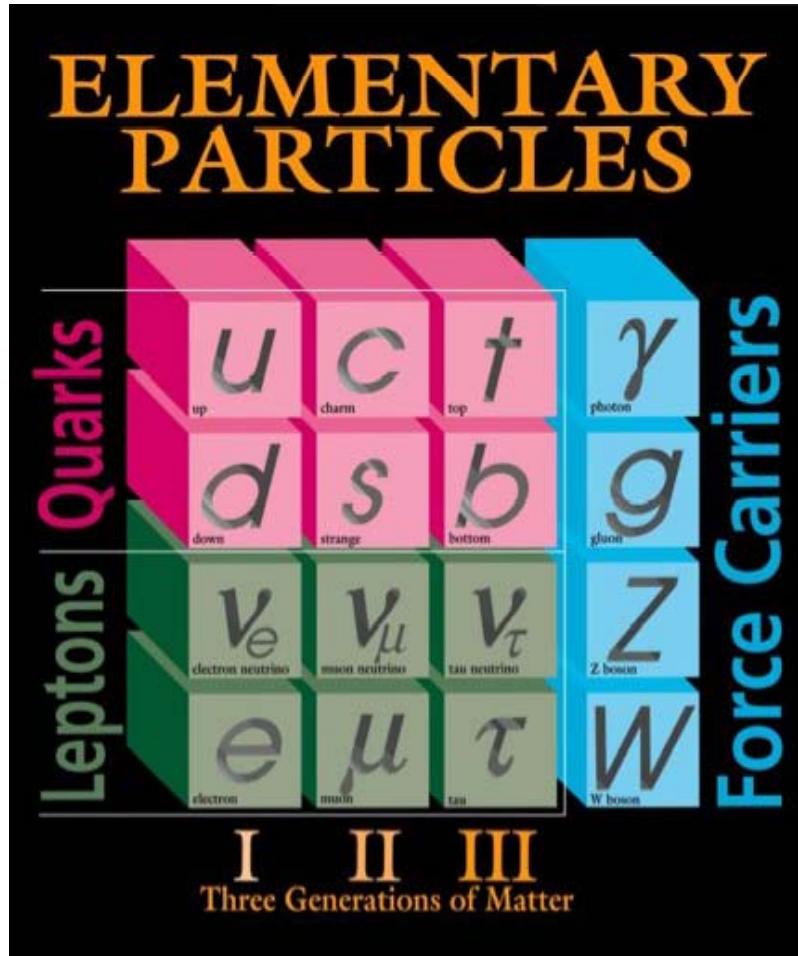


# Trigger system

Accepted event rates (Hz):



# Physics Motivation



Higgs → 3rd family → Displaced vertices → Beamline algorithm

# Desired Properties for Algorithm

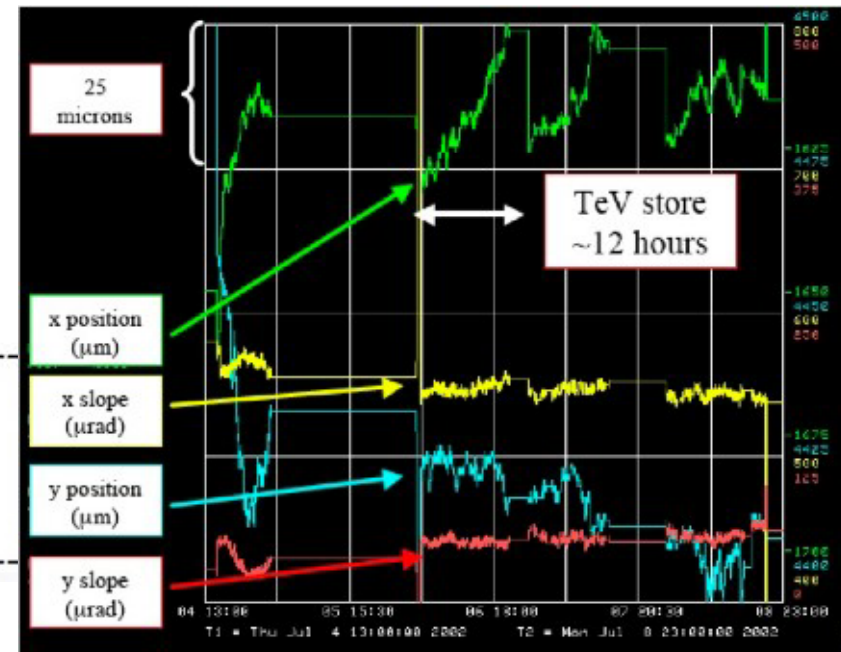
**Fast**      **Finite**      **Accurate**      **Robust**  
**Memory**

This page updates automatically every 5 seconds

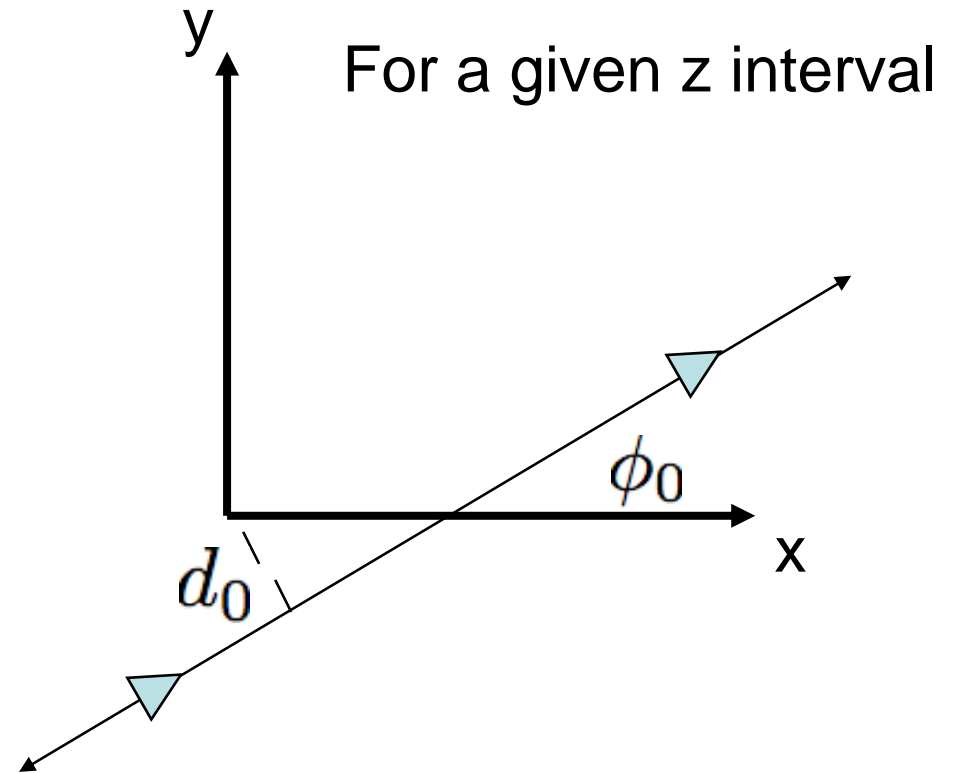
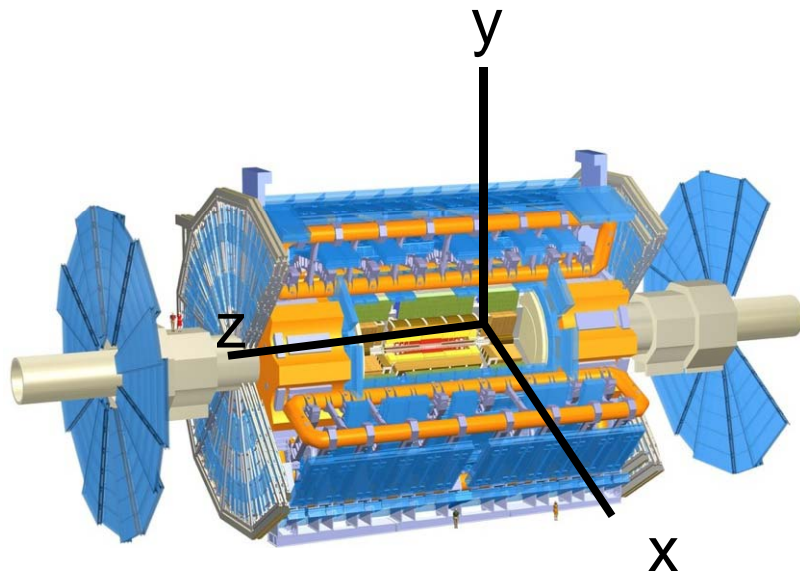
Last update : 2008/02/20 04:46:08

Coordinates are in microns

	z	ntrks	x	y	sigma	err x	err y	corr
0:	5354	-1629.44	1269.44	71.29	1.347	1.464	-0.000	
1:	11108	-1540.65	1249.96	67.34	0.900	0.908	-0.000	
2:	25164	-1441.89	1233.19	65.18	0.578	0.586	0.000	
3:	25278	-1358.36	1228.84	61.13	0.564	0.526	-0.000	
4:	14759	-1260.43	1210.22	65.12	0.738	0.805	-0.000	
5:	8121	-1177.61	1192.04	67.19	1.084	1.027	0.000	



# Track Information

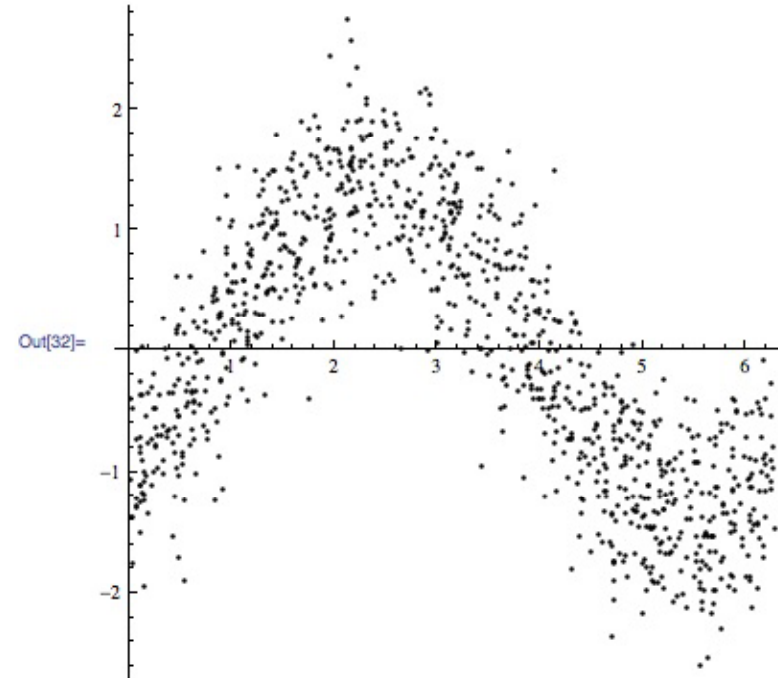


Other parameters:  $p_T$ ,  $\eta$

# How the Fitter Works

Use  $(d_0, \phi_0)$  information from tracks to fit for the vertex position

Use  $d_0$  correlation of track pairs to fit for width



$$\langle d_1 d_2 \rangle = \sin \phi_1 (\sigma_x^2 - \sigma_{xy} \cos \phi_2) + \cos \phi_1 (\sigma_y^2 - \sigma_{xy} \sin \phi_2)$$

time (each step uses new tracks)

tighter IP cut  
(center taken from n.m-1)

```

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Iter 1.1 Iter 2.1 Iter 3.1 Iter 4.1 Iter 5.1 Iter 6.1 ...
      Iter 1.2 Iter 2.2 Iter 3.2 Iter 4.2 Iter 5.2 ...
                Iter 1.3 Iter 2.3 Iter 3.3 Iter 4.3 ...
                    Iter 1.4 Iter 2.4 Iter 3.4 ...
                        Iter 1.5 Iter 2.5 ...
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```

Beam position  
goes from n.m-1  
to n.m and from  
n.5 to n+1.1







# Some Results

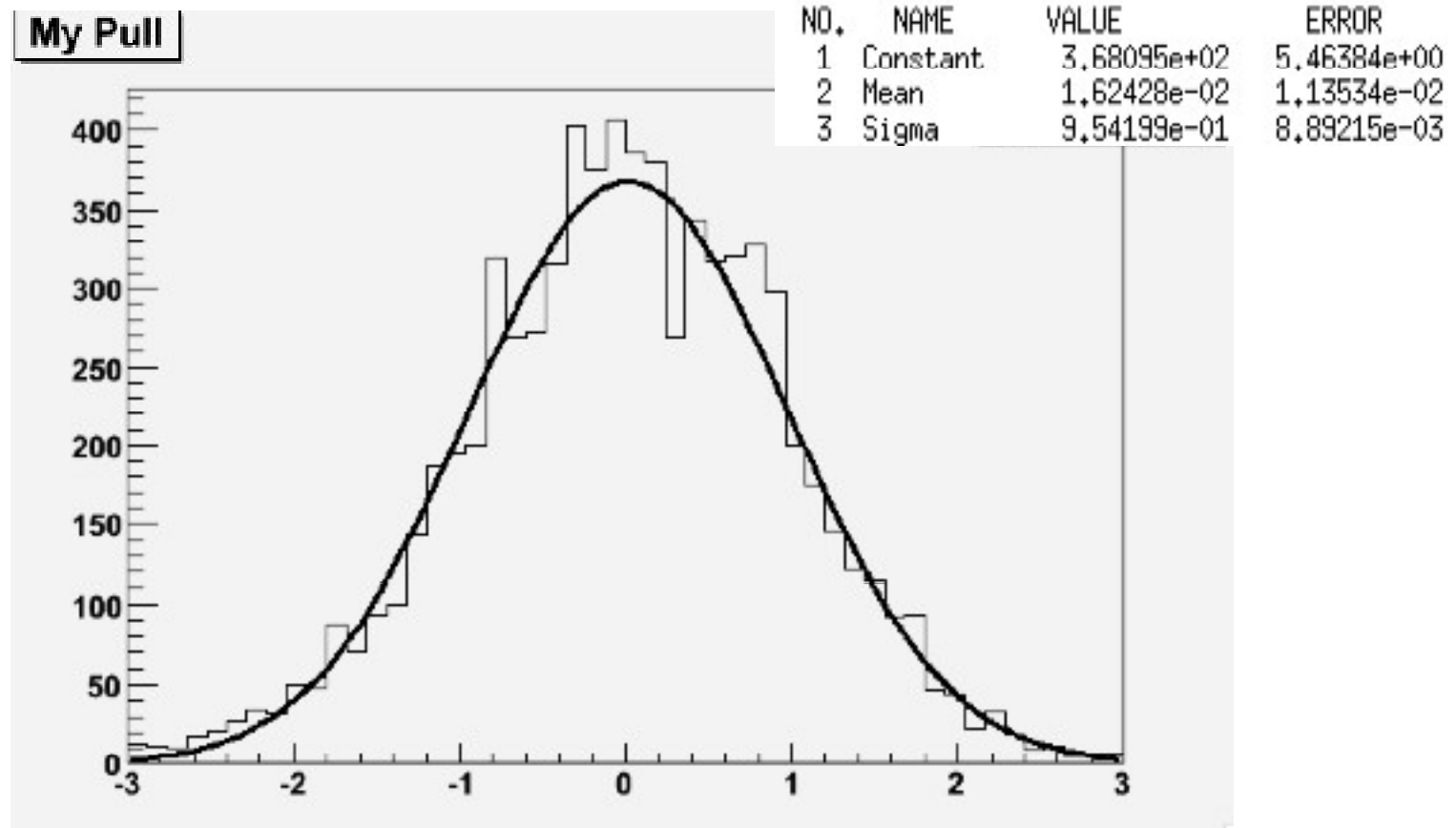
I get out what I put in: I asked a “toy” Monte Carlo to generate tracks from a fixed vertex at  $x = 20$  mm

This histogram is for the  $x$  coordinate of the vertex, fit separately for tracks in different parts of the detector

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

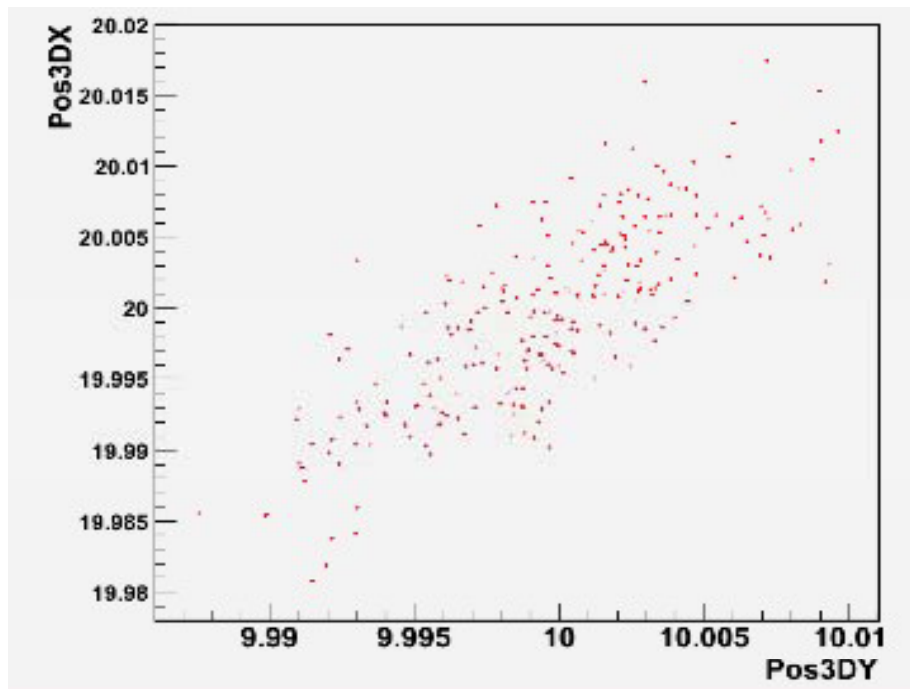
# Some results (cont.)

Normalized, centered fit results follow a standard normal distribution for fixed vertex from toy Monte Carlo  
This histogram is for the x coordinate of the vertex as fit in the separate z sections



# Some results (cont.)

Cuts on impact parameter can lead to increased fit variability, and correlations between fit vertex coordinates



Cut is too tight

QuickTime™ and a  
TIFF (Uncompressed) decompressor  
are needed to see this picture.

Loosened cut



# Future Plans

- Further assessment needed
- More detailed simulation
- Optimization
- Online implementation

# Acknowledgments

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