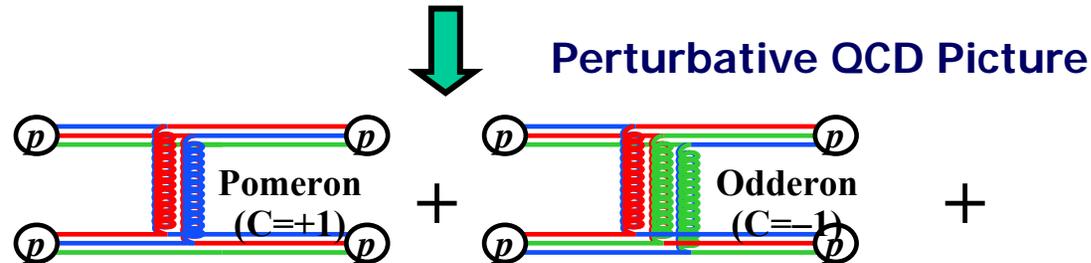
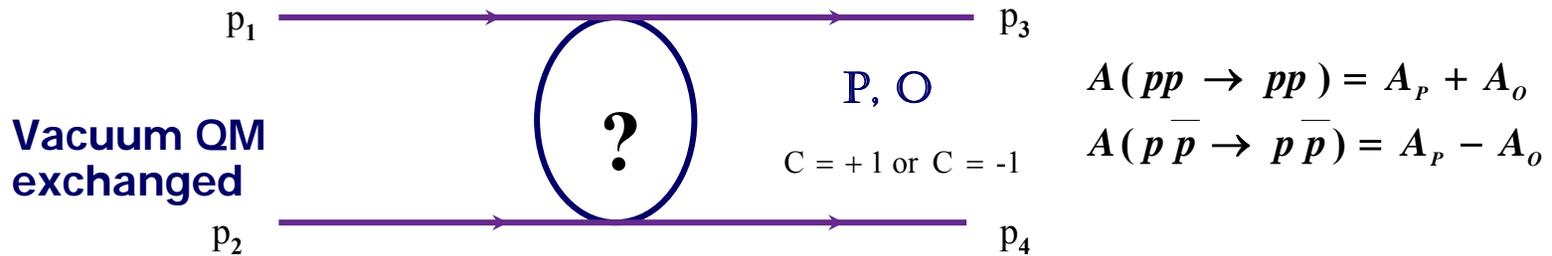


# Status of Run 2003 Analysis of pp2pp Experiment

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## Process of Elastic Scattering



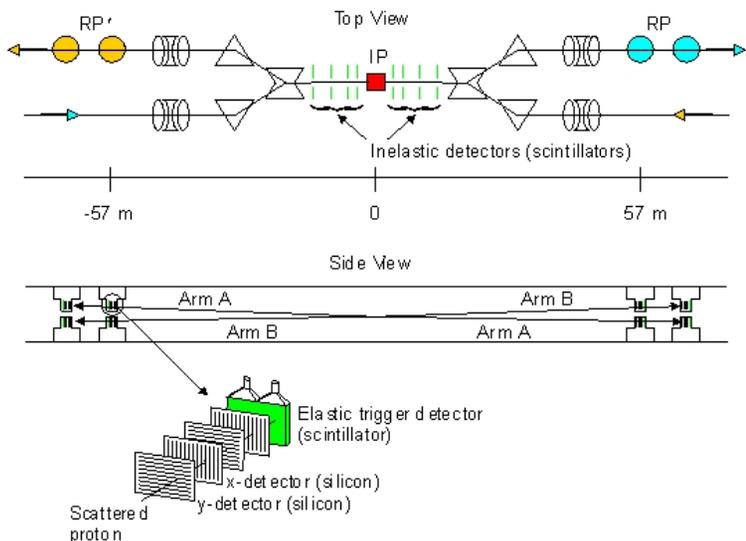
$$s = (p_1 + p_2)^2 = (\text{C.M energy})^2 \quad t = (p_1 - p_3)^2 = -(\text{four momentum transfer})^2$$

$s \rightarrow \infty \quad |t| \leq 1 \text{ (GeV/c)}^2$  – Non-perturbative regime

Elastic scattering  $d\sigma/dt$  + optical theorem  $\Rightarrow$  total cross section  $\sigma_{\text{tot}}$

# The pp2pp Experimental Setup

- Elastically scattered protons have very small scattering angle  $\theta^*$ , hence beam transport magnets determine trajectory of scattered protons
- The optimal position for the detectors is where scattered protons are well separated from beam protons
- Need Roman Pot to measure scattered protons close to the beam without breaking accelerator vacuum



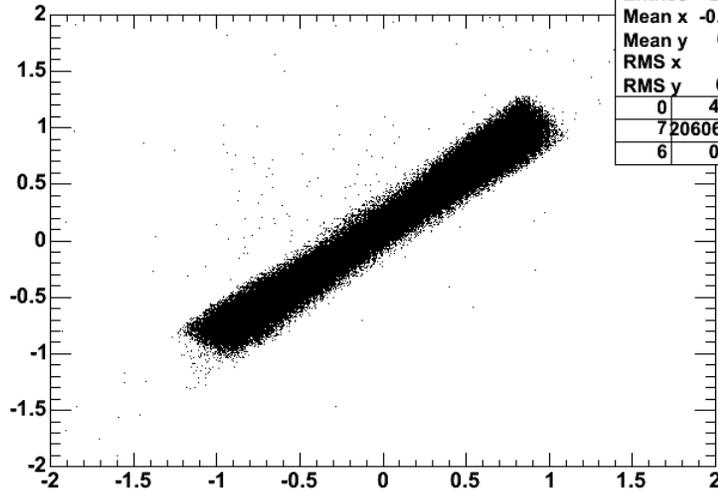
## What was new in Run 2003?

	Engineering 2002	2003
<b>Number of RP stations</b>	<b>2</b>	<b>4</b>
<b>Number of Si planes</b>	<b>16</b>	<b>32</b>
<b>Number of elastic events</b>	<b><math>3 \cdot 10^5</math></b>	<b><math>3 \cdot 10^6</math></b>
<b>Beam momentum</b>	<b>100 GeV</b>	
<b>Number of bunches</b>	<b>55</b>	
<b><math>\beta^*</math></b>	<b>10 m</b>	
<b>Beam emittance <math>\varepsilon</math> [mm mrad]</b>	<b><math>12\pi</math></b>	<b><math>17\pi</math></b>
<b><math> t </math>-range</b>	<b><math>0.004-0.035</math> (GeV/c)<sup>2</sup></b>	
<b>Proton intensity</b>	<b><math>5 \cdot 10^{11}</math></b>	<b><math>19 \cdot 10^{11}</math></b>
<b>Proton beam polarization (estimate)</b>	<b>0.24</b>	<b>0.37</b>

# Elastic Events: Co-linearity and dN/dt

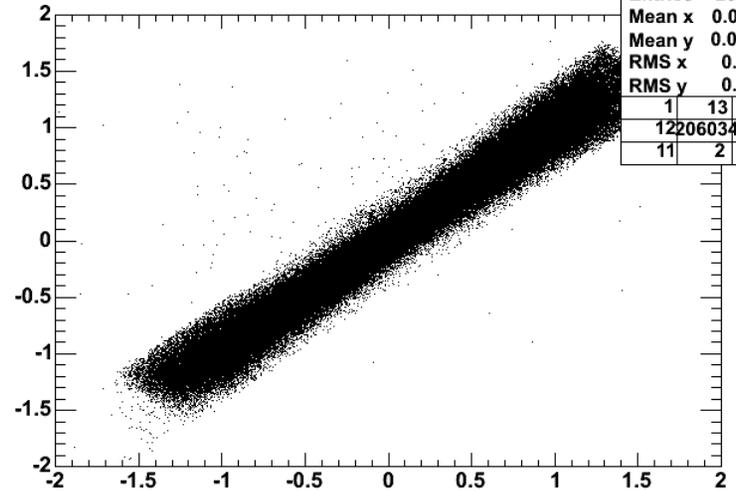
Note very clean data set!

$x_{AU}$  vs.  $x_{AD}$  arms:AU-AD at the Pots



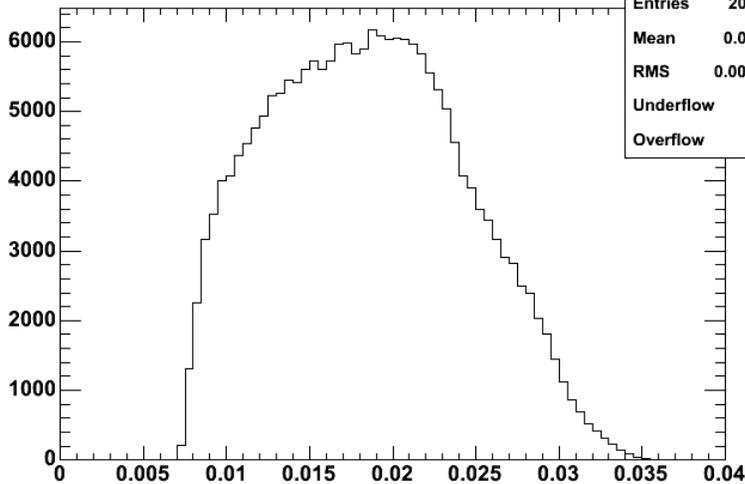
xxAUAD		
Entries	206089	
Mean x	-0.01155	
Mean y	0.1177	
RMS x	0.502	
RMS y	0.4985	
0	4	3
7	206067	2
6	0	0

$\Theta_{xAU}$  vs.  $\Theta_{xAD}$  arms:AU-AD at IP



thxAUAD		
Entries	206089	
Mean x	0.08116	
Mean y	0.09559	
RMS x	0.7136	
RMS y	0.7093	
1	13	12
12	206034	4
11	2	0

-t distribution for Arm A



dNdtArmA	
Entries	206089
Mean	0.01848
RMS	0.005795
Underflow	0
Overflow	65

Est. of stat. error	Run 2002	Run 2003
Nuclear slope $\Delta B$	$1.6 \text{ GeV/c}^{-2}$	$0.35 \text{ (GeV/c)}^{-2}$
Raw asymmetry $\Delta \epsilon_N$	0.007	0.001
Total cross section $\Delta \sigma_{Tot}$		2-3 mb