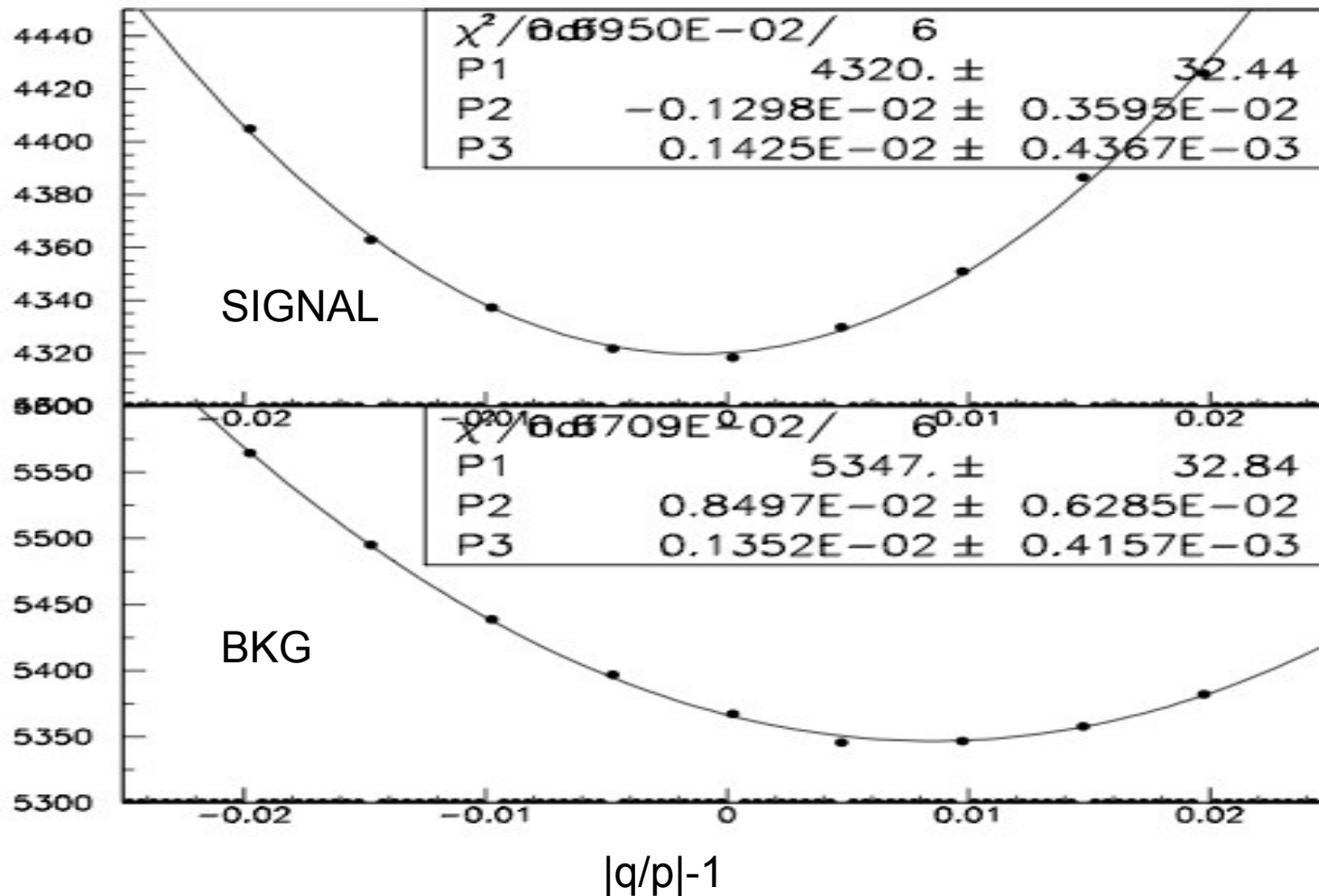


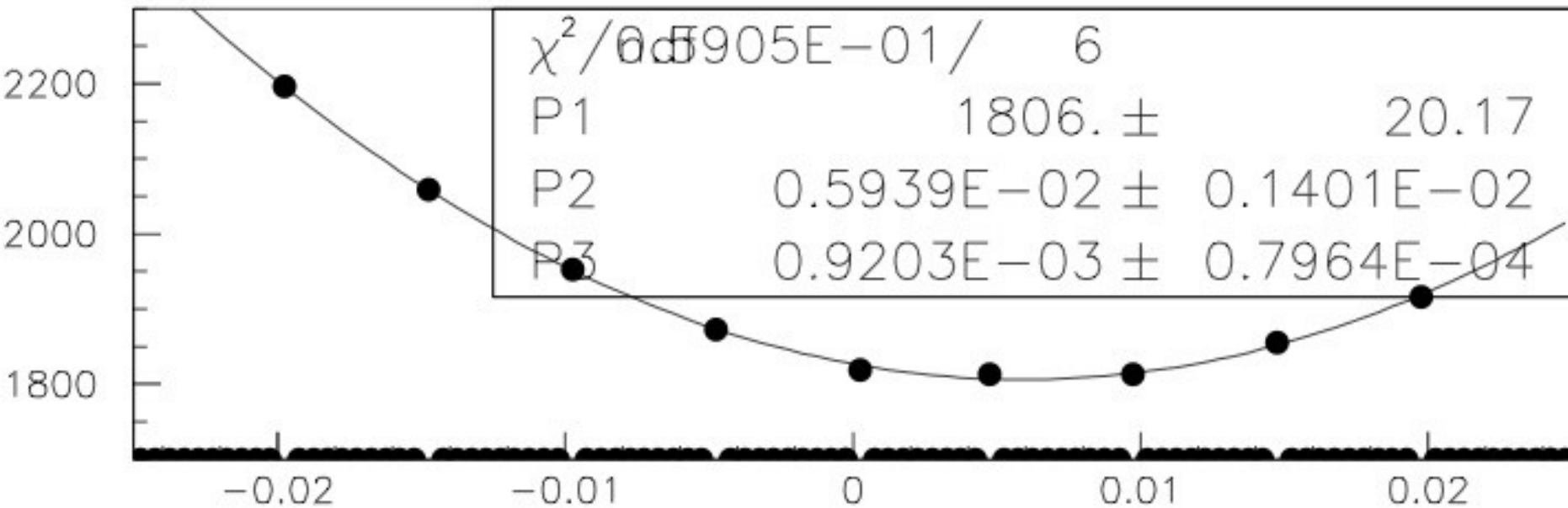
# Status of the Analysis bias comprehension in the $D^*1$ q/p Analysis

- Old Problem: bias in the  $B^0$  BKG sector:

Martino  
12/9/08



...Which results in a ~average bias in the  $B^0$  SIGNAL+BKG Fit:

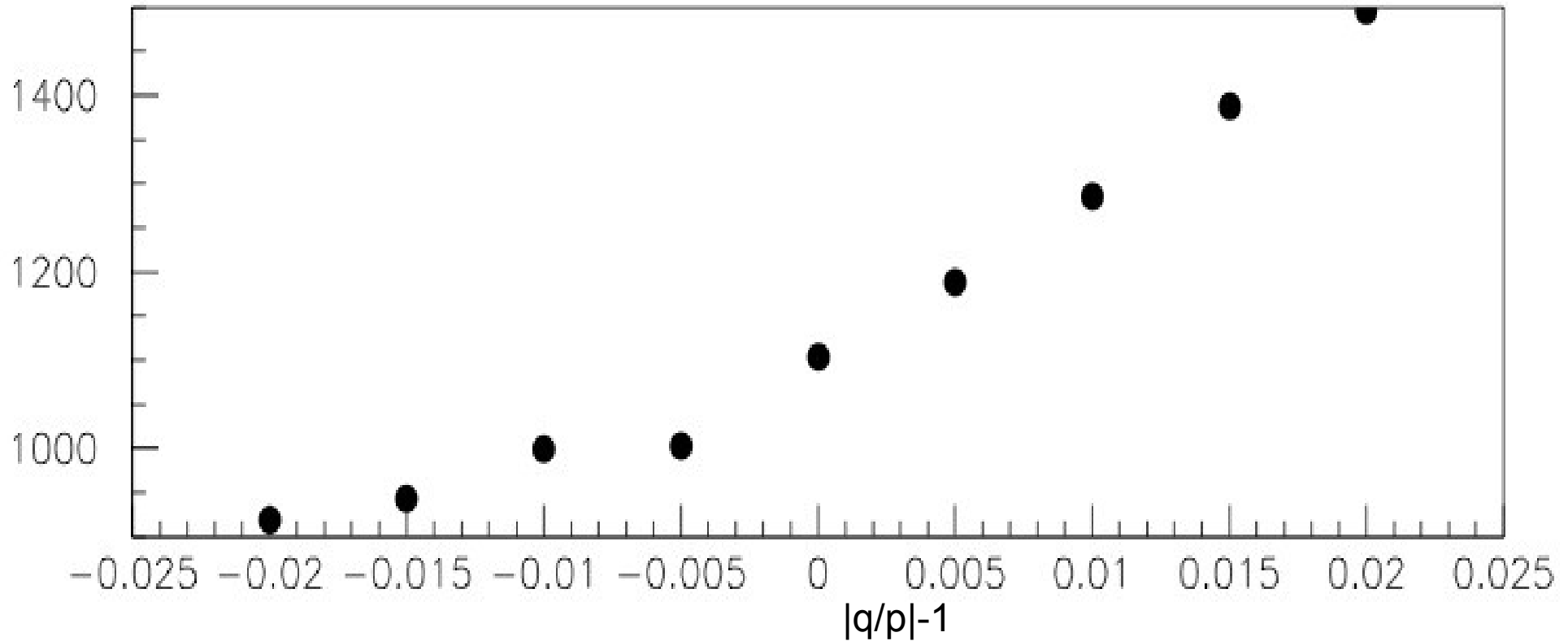


$|q/p|$  comes from a binomial constraint on the mixed positive vs mixed negative events.

- Tried to avoid the BKG influence in the global fit by using two alternative strategies:

- 1) Remove the BKG sample from the binomial constraint;
- 2) Use an additional effective  $|q/p|$  parameter for the BKG.

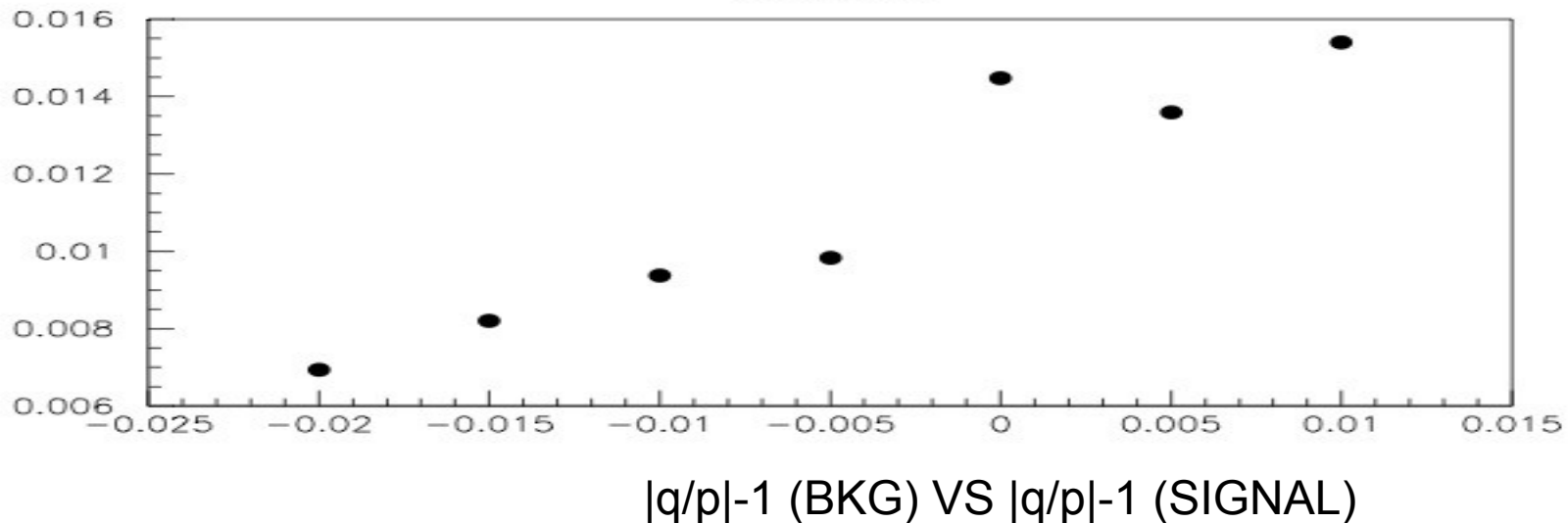
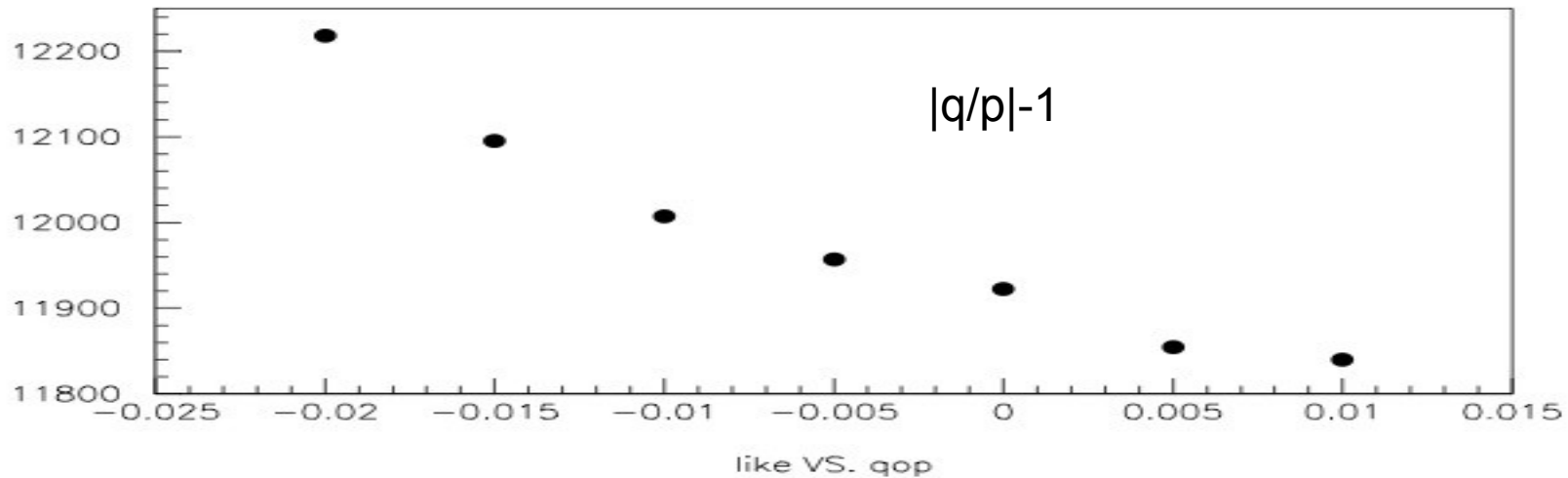
Strategy 1: Remove BKG events from the binomial constraint and use just signal events in the determination of  $|q/p|$ :



Result worst than before... Why?

In the global Signal+BKG fit the not perfect separation between the two components (see later) reflects in the necessity to use both the signal & BKG yields in the constraint.

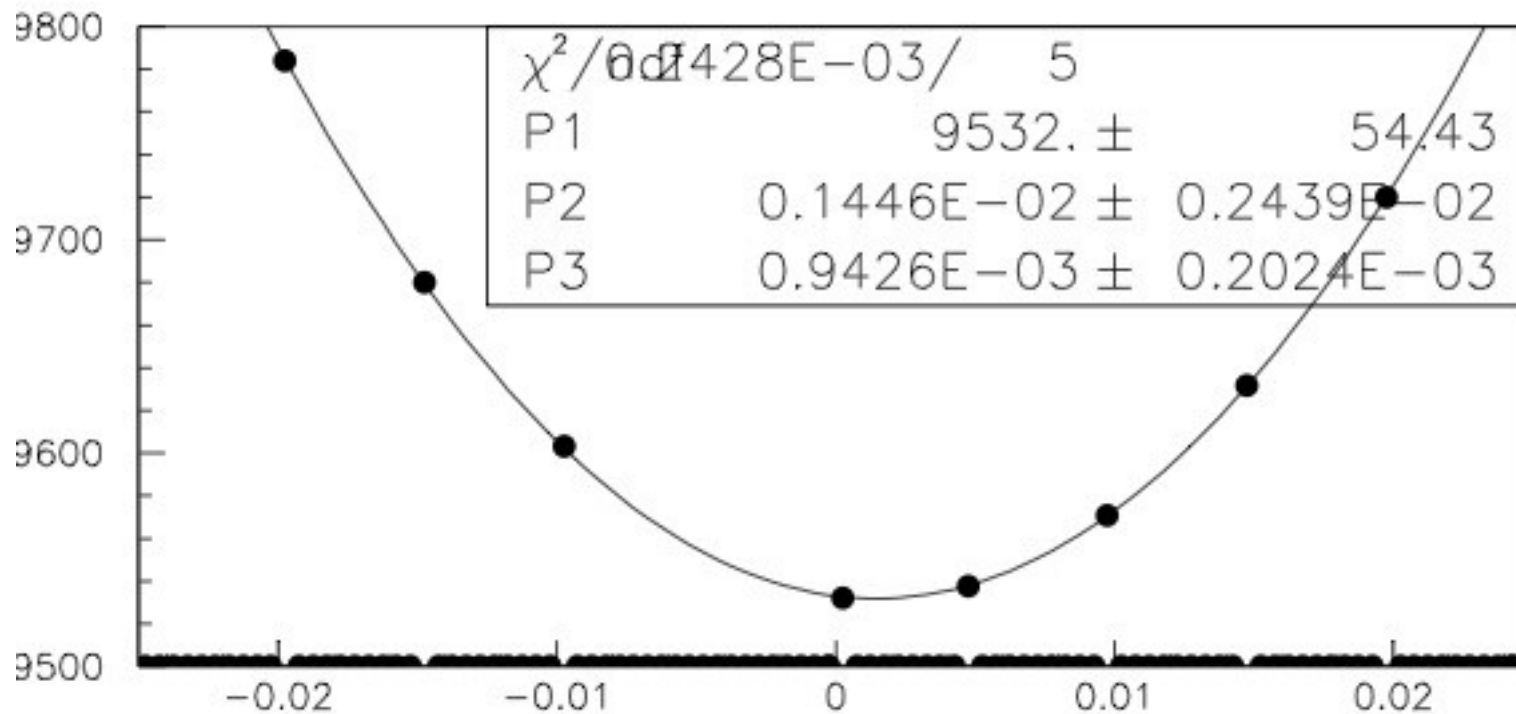
## Strategy 2: use 2 different $|q/p|-1$ parameters Signal vs BKG



Two  $|q/p|-1$  parameters are strongly correlated... **Strategy does not work**

Is the Bias just a  $B^0$  BKG feature?

Exercise: Use  $B^0$  Signal+ $B^+$  BKG samples:

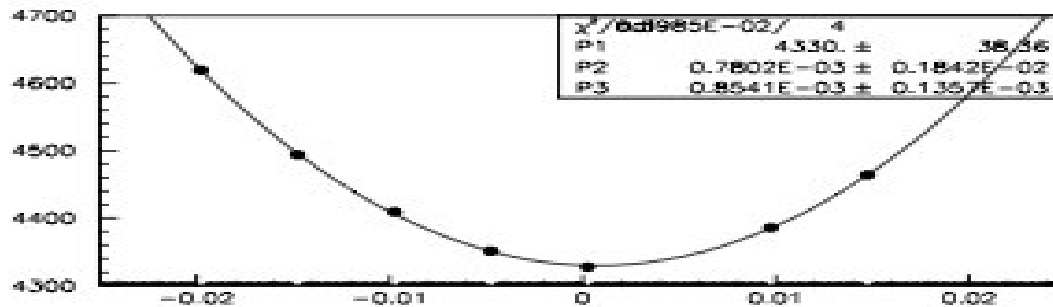


**NO BIAS! ONLY  $B^0$  BKG IS AFFECTED!**

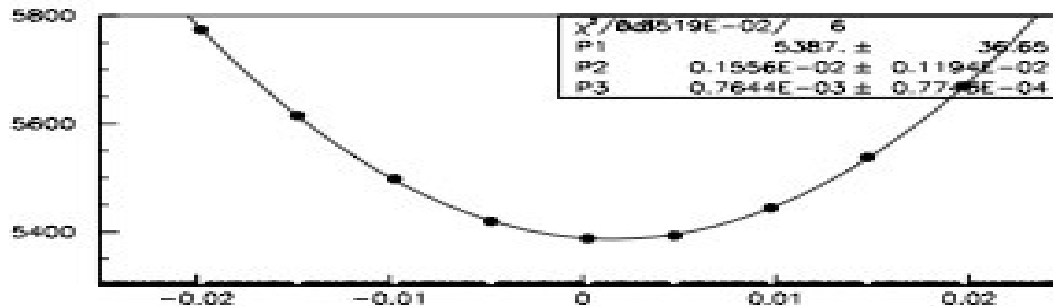
Crucial point: determination of the detector asymmetry in the BKG sector

Reconstruction Asymmetry determination improved by using in addition also the untagged event sample.

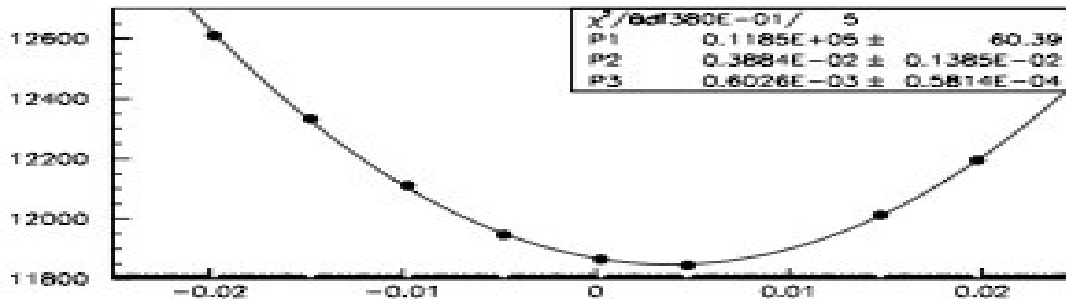
Statistical correlation between the tagged & untagged samples to be taken into account... (to be done).




Signal: No bias



**BKG: bias almost removed!**



Global fit: still some problem in the SIG+BKG combination... **2<sup>nd</sup> Hint of wrong relative fractions?** 

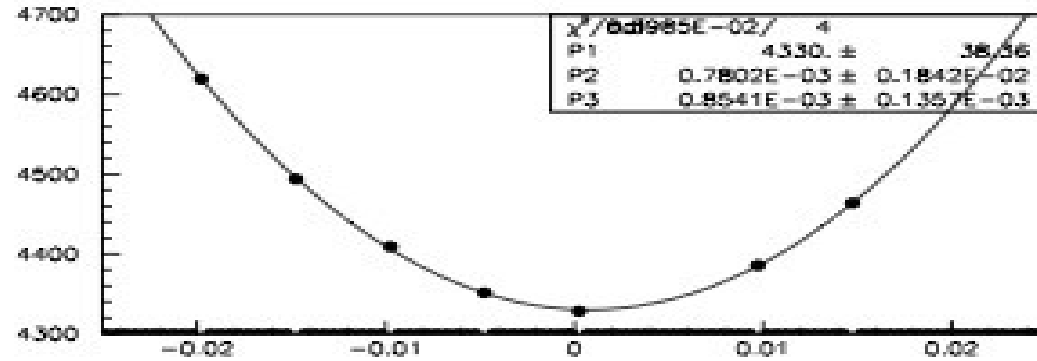
Check the Signal Fraction in the global sample by comparing the **predicted Signal VS BKG yields in the global fit with the true ones** (predicted/true ratio)

	SIGNAL			
	$e^+K^+$	$e^-K^-$	$\pi^+K^+$	$\pi^-K^-$
Btag	0.851	0.855	0.940	0.945
Dtag	0.946	0.947	0.955	0.955
	BKG			
Btag	1.117	1.113	1.013	1.039
Dtag	1.066	1.066	1.064	1.047

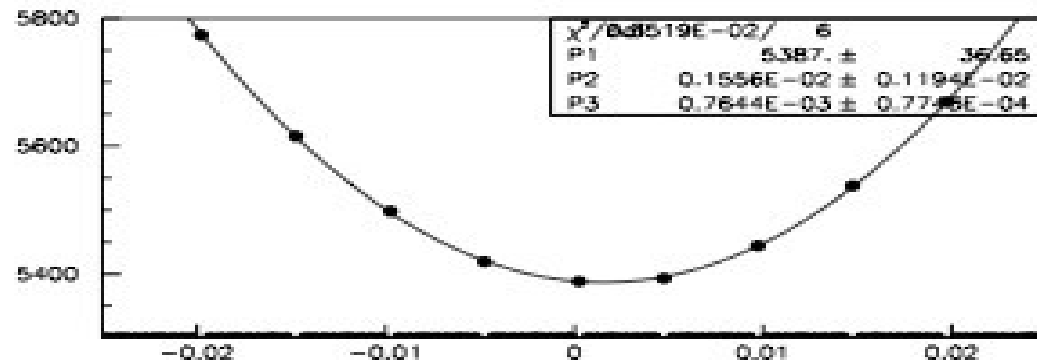
**HUGE Discrepancy!**

**Bug in the Signal Fraction ( $m_{\square}^2$ )? To be investigated soon**

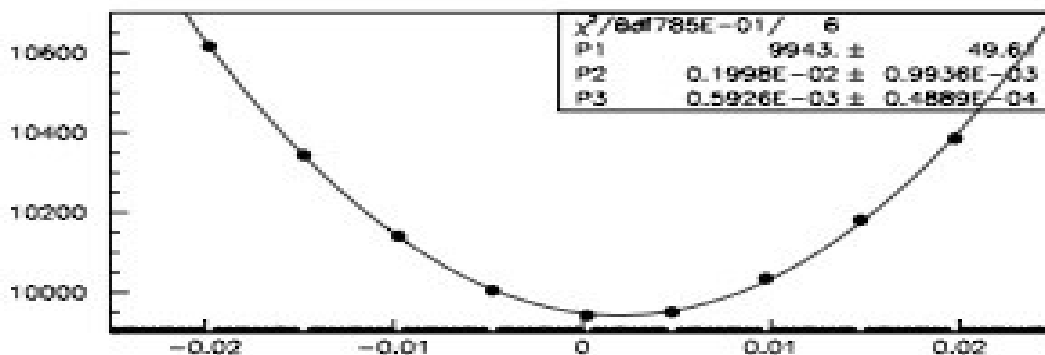
Avoid the Signal Fraction problem by using the true Signal & BKG yields in the constraint for the  $|q/p|$  determination:



**One half of the effect removed!**



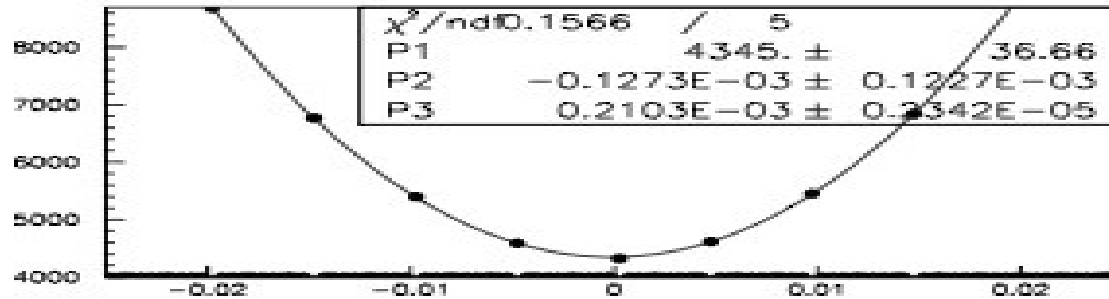
**Compatibility between the SIG vs BKG detector asymmetries to be checked. Small discrepancy could be at the origin of the residual bias in the SIG+BKG combination**



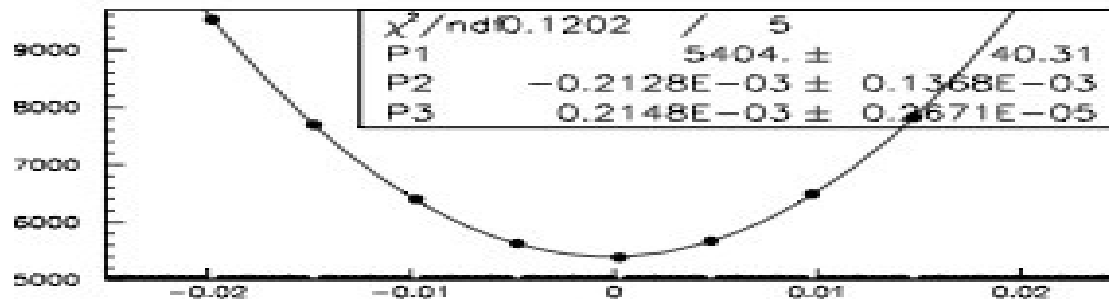


# Signal vs BKG Detector Asymmetries

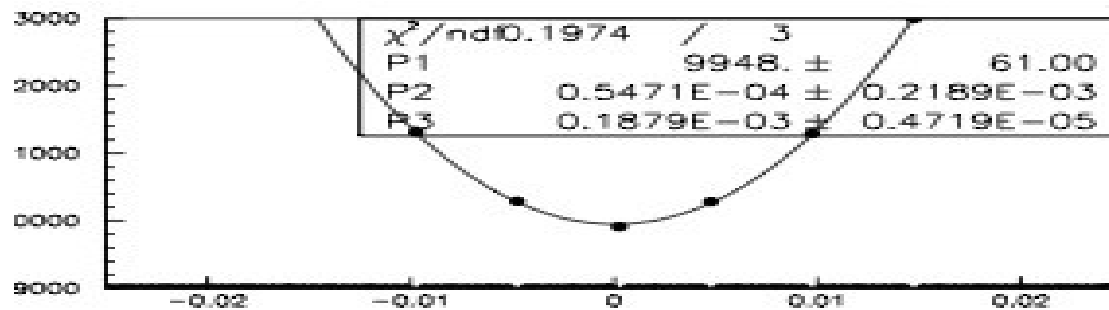
## Reconstruction Asymmetry for electron sample



Signal



BKG



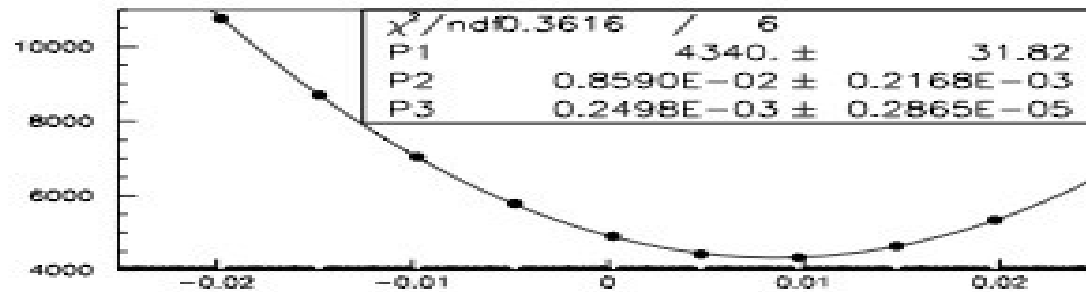
ALL

**GOOD  
AGREEMENT**

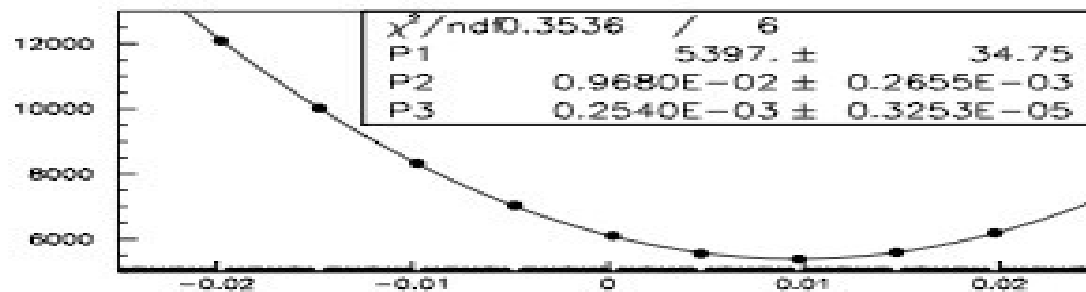
$$\sigma(\text{sig/bkg}) = (1 \pm 3) \cdot 10^{-4}$$

# Signal vs BKG Detector Asymmetries

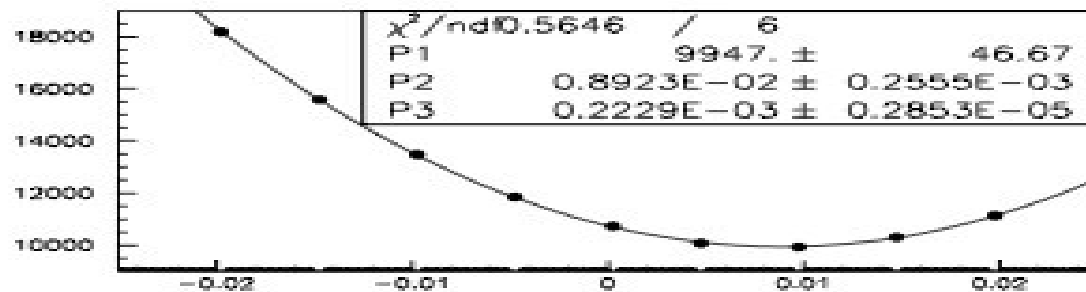
## Reconstruction Asymmetry for muon sample



Signal



BKG



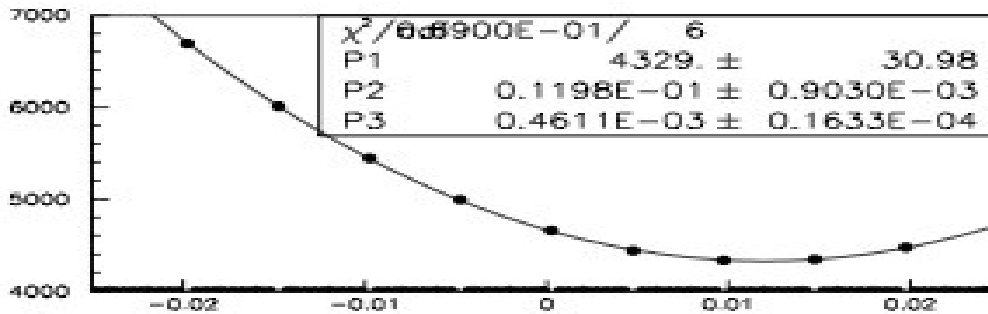
ALL

**NOT PERFECT  
AGREEMENT**

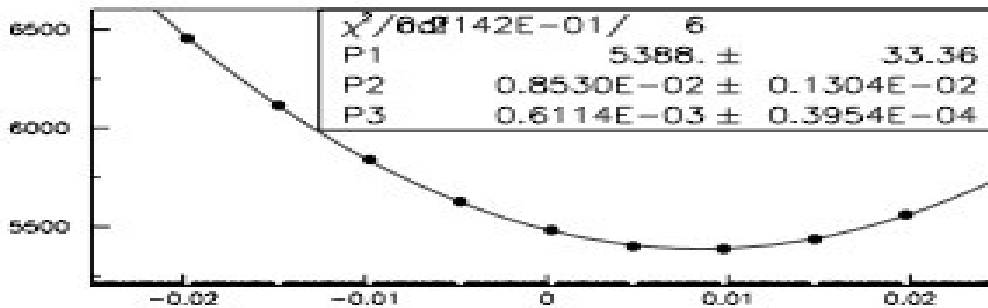
$$\square(\text{sig/bkg}) = (-1.1 \pm 4) \cdot 10^{-3}$$

# Signal vs BKG Detector Asymmetries

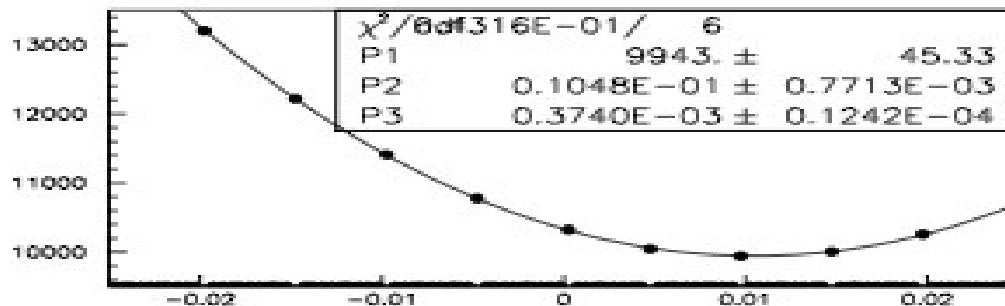
## Tagging Asymmetry



Signal



BKG



ALL

**BAD  
AGREEMENT:  
ANY PROBLEM?**

$$\square(\text{sig/bkg}) = (3.4 \pm 8) * 10^{-3}$$

# Reconstruction Asymmetry Check

Signal Sample

BKG Sample

Electrons

Mass Band  $-0.0006 \pm 0.0003$

$0.0015 \pm 0.0005$

Side Band -

$-0.0018 \pm 0.0005$

$\Delta(\text{SB/MB})$  -

$-0.0033 \pm 0.0007$

$\Delta(\text{SIG/BKG})$

$-0.0003 \pm 0.0005$

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Muons

Mass Band  $0.0074 \pm 0.0004$

$0.0108 \pm 0.0006$

Side Band -

$0.0125 \pm 0.0006$

$\Delta$  -

$-0.0017 \pm 0.0008$

$\Delta(\text{SIG/BKG})$

$-0.0041 \pm 0.0007$

# Conclusion & Next Steps

## **$B^0$ BKG bias reduced by a factor 2 ( $\sim 0.0020$ ):**

- Reconstruction asymmetry obtained using in addition the untagged event sample (statistical correlation with the tagged event sample to be taken into account);
- Found a Bug in the Signal fraction to be fixed;
- **Is the discrepancy between Signal & BKG detector asymmetries at the origin of the residual  $|q/p|$  bias? Check in the next few days;**

## **NEXT STEPS**

IDEA: Statistical correlation between tagged and untagged samples can be removed by a two steps procedure:

- 1) Determine the detector asymmetries from the  $M_{V^2}$  SIDE BAND (very low dependence on  $|q/p|$ ) and fix them in the fit.
- 2) Fit just the MASS BAND for the  $|q/p|$  determination.