RC Meeting, August 7 2012

News:

- Toy Monte Carlo validation:
  - MC Fit (two strategies)
  - Real Data Fit

- Computation of systematic errors finalized
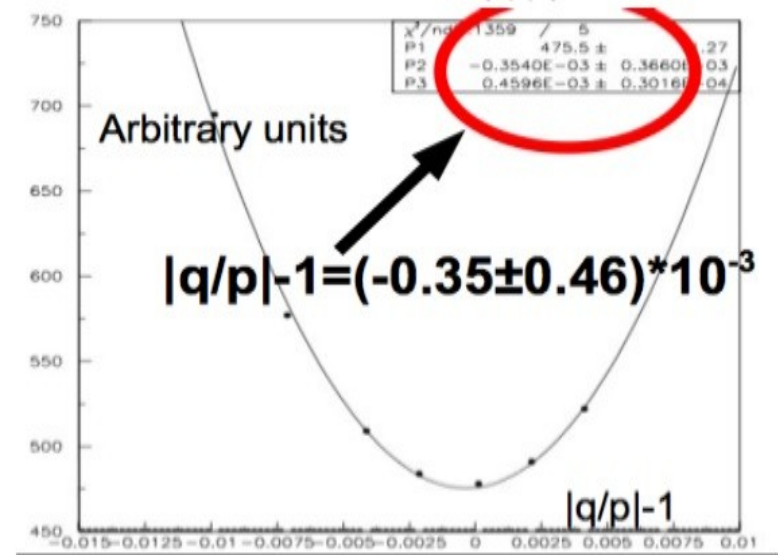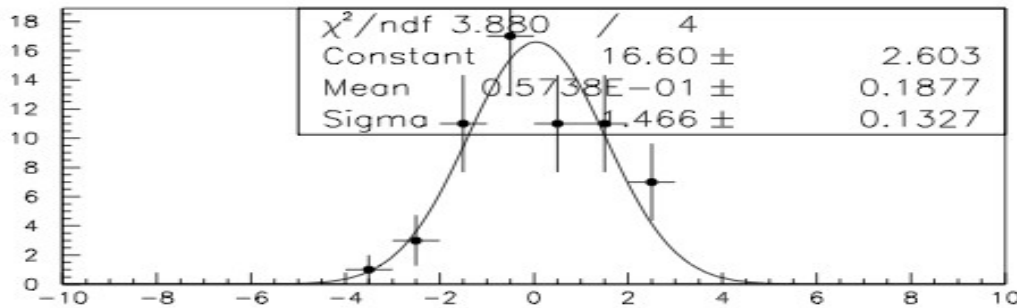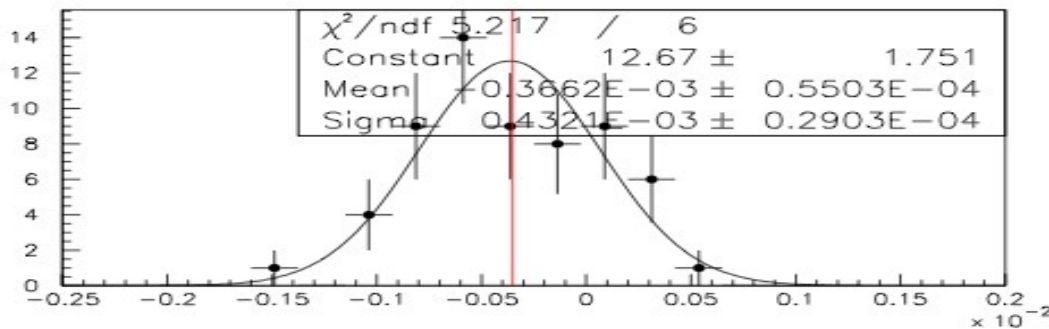
Toy MC Validation

- MC Fit Validation

    - ➜ Many pseudo-experiments generated by randomizing the number of events in the various subsamples: (B0,B+)X(BKG,Peaking)X(Btag,Dtag), Off-Peak, Continuum, CP-eigenstatesX(Btag,Dtag); 95% of the full statistics considered to allow for positive fluctuactions.

    - ➜ Every subsample divided according to lepton kind (e/μ) and different charge combination for the (lepton, Kaon) pair: Total of 96 different categories considered

    - ➜ Relevant variables shapes randomized for every category: PK, Δt, $\sigma(\Delta t)$, θ(lepton-K)

Toy MC Validation

- Two different strategies considered:

    1) Every event is assigned to the right category according to the MC informations. The shapes of the distributions are predicted by the simulation;

    2) Every event is assigned to the category determined by the fit itself. The shapes of the distributions are the projections of the likelihood in the corresponding variable.

- Strategy n. 2) used also in the validation of the Real Data fit

Toy MC Validation

- Strategy n. 1 (values in unit of 10^{-4})

- Likelihood Scan:-3.5±4.6
- Nominal Fit:-3.5±3.0
- Toy Spread: -3.7±4.3
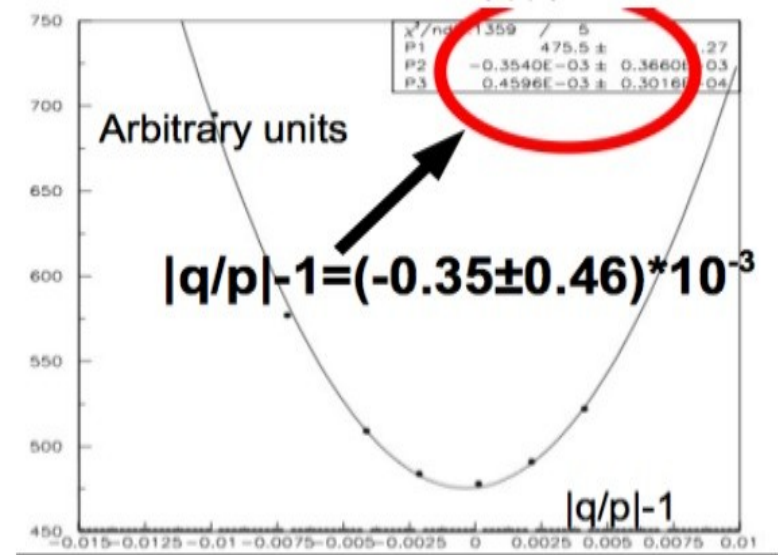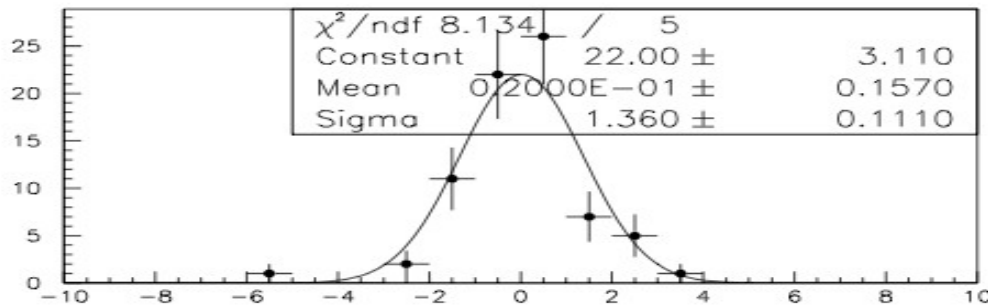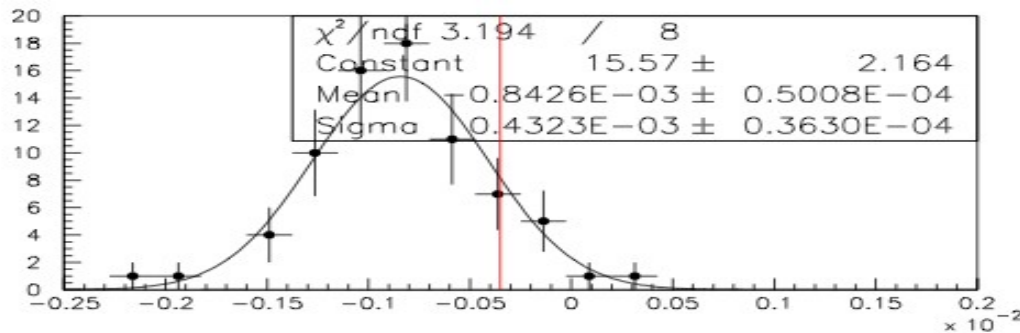- Toy Pull:1.466

- Corrected Toy stat. error $4.3/\sqrt{0.95} \approx 4.4$ in good agreement with Likel. scan
- Pull X Fit stat. Error=4.4 OK

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Toy MC Validation

- Strategy n. 2 (values in unit of 10^{-4})

- Likelihood Scan: -3.5±4.6
- Nominal Fit: -3.5±3.0
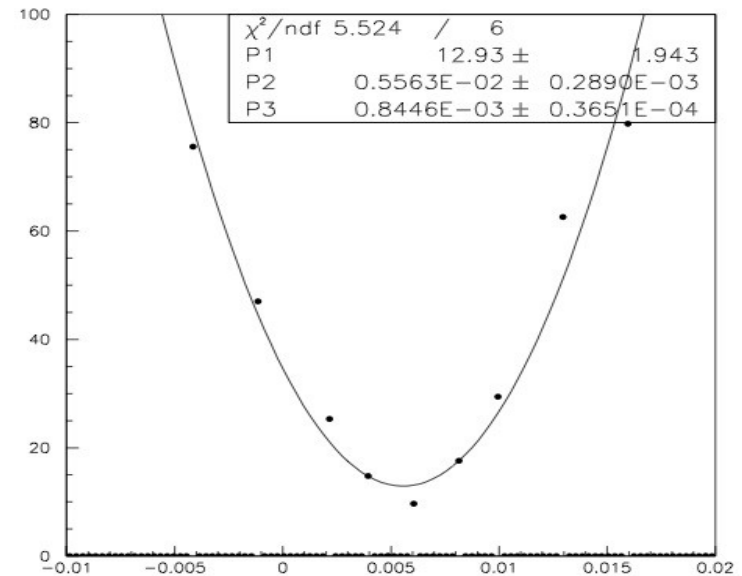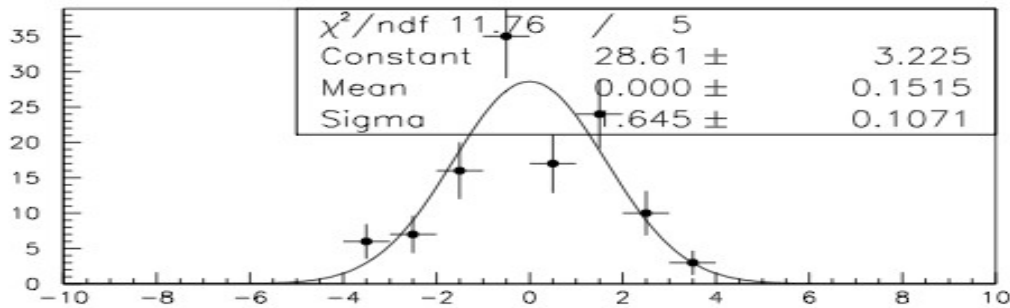- Toy Spread: -8.4±4.3
- Toy Pull: 1.360

- Corr. Toy stat. error: 4.4 in good agreement with Likel. scan
- Pull X Fit stat. Error≈4.1
- Bias of 4.9: systematic error 5

Toy MC Validation

- Real data Fit (Blind values in unit of 10^{-4})

χ^2/ndf 4.003 / 6
Constant 26.35 $\pm$ 2.971
Mean 0.5165E−02 $\pm$ 0.8227E−04
Sigma 0.8933E−03 $\pm$ 0.5816E−04

χ^2/ndf 11.76 / 5
Constant 28.61 $\pm$ 3.225
Mean 0.000 $\pm$ 0.1515
Sigma 1.645 $\pm$ 0.1071

χ^2/ndf 5.524 / 6
P1 12.93 $\pm$ 1.943
P2 0.5563E−02 $\pm$ 0.2890E−03
P3 0.8446E−03 $\pm$ 0.3651E−04

- Likelihood Scan:55.6±8.4
- Nominal Fit:55.2±5.2
- Toy Spread: 51.6±8.9
- Toy Pull:1.645
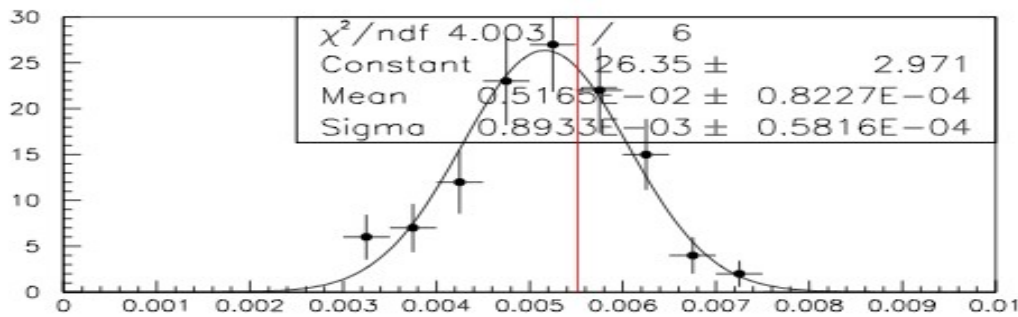
- Corr. Toy stat. error: 9.1 in agreement with Likel. scan
- Pull X Fit stat. Error=8.6
- Bias of 3.6: systematic error (?)

Systematics ($\times 10^{-4}$)

- Sample composition determined by external fit by floating D**, D*, Combinatorial & assuming Continuum from rescaled Offpeak, CP-eigenstates from MC and B+/B0 fraction from MC.
    - → D**, D*, Combinatorial varied exploiting covariance matrix (biggest assumed as systematic error)≈ ±10.9
    - → CP fraction varied by ±50%≈ ±3.1
    - → B+/B0 combinatorial BKG varied by ±10%≈ ±8.7
    - → Peaking BKG varied by ±20%≈ +2.2/-9.6
- Analysis Bias 1: δ (Lik scan$_{MC}$) ≈±4.6
- Analysis Bias 2 (Toy study)≈-3.6
- B0 lifetime fixed to PDG≈+1.8
- B+ lifetime fixed to PDG≈+2.0
- Δm_d fixed to PDG≈+0.6

Systematics/Results

Table 9: Systematic errors due to D_{tag} description.

Source	$\Delta|q/p|$
Δt shape	$+1.30 \times 10^{-3}$
R_{MC}	$^{+0.10}_{-0.31} \times 10^{-3}$
Total	$^{+1.30}_{-0.31} \times 10^{-3}$

Systematics from Sample Composition:

Source	$\Delta|q/p|$
Combinatorial	$\pm 1.09 \times 10^{-3}$
D^{**}	$\pm 0.78 \times 10^{-3}$
D^{*}	$\pm 0.44 \times 10^{-3}$
Peaking Background	$^{+0.22}_{-0.96} \times 10^{-3}$
B^{-} Combinatorial Fraction	$\pm 0.87 \times 10^{-3}$
CP-eigenstates	-0.31×10^{-3}
Total	$^{+1.41}_{-1.73} \times 10^{-3}$

Table 11: Systematic uncertainties on $|q/p|$.

Source	$\Delta|q/p|$
D_{tag} description	$^{+1.30}_{-0.31} \times 10^{-3}$
$\Delta\epsilon_{Rec}$	$\pm 0.01 \times 10^{-3}$
$\Delta\epsilon_{Tag}$	$\pm 0.07 \times 10^{-3}$
Resolution	$+0.60 \times 10^{-3}$
Analysis bias (MC statistical error)	$\pm 0.46 \times 10^{-3}$
Analysis bias (Toy MC)	$-0.36 \ \ 10^{-3}$
Sample composition	$^{+1.41}_{-1.73} \times 10^{-3}$
CP-eigenstates parameterization	-
τ_{B^0}	$+0.18 \times 10^{-3}$
τ_{B^-}	$+0.20 \times 10^{-3}$
Δm_d	$+0.06 \times 10^{-3}$
Total	$^{+2.08}_{-1.85} \times 10^{-3}$

Blind Result (X 10^{-3})

$|q/p|-1 \approx X \pm 0.91 +2.08/-~1.85$

$Asl \approx X + 4.6/-~4.2$

B-factories average

$Asl \approx ~4.7 \pm 4.6$

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