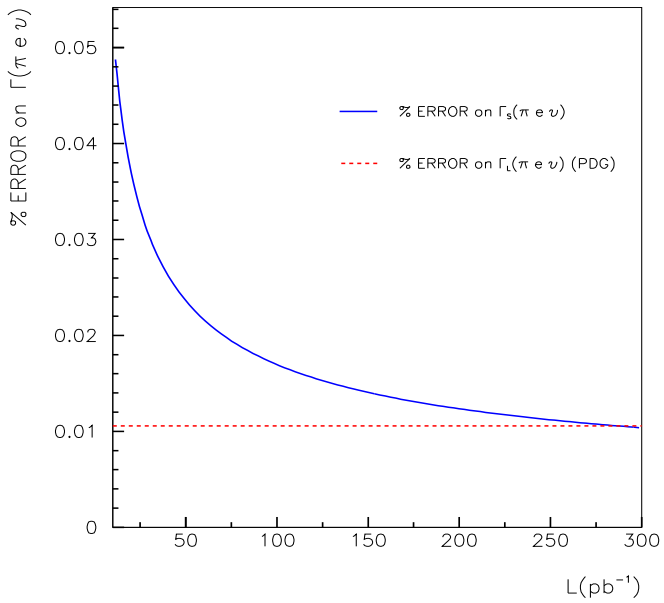
CP-Group Activities

- $K_S \to \pi e \nu$
- $(K_S \to \pi^+ \pi^-)/(K_S \to \pi^0 \pi^0)$
- $K_L \to \pi^+ \pi^-$
- ( ) / ( )
- $K_L \to \pi^0 \pi^0$

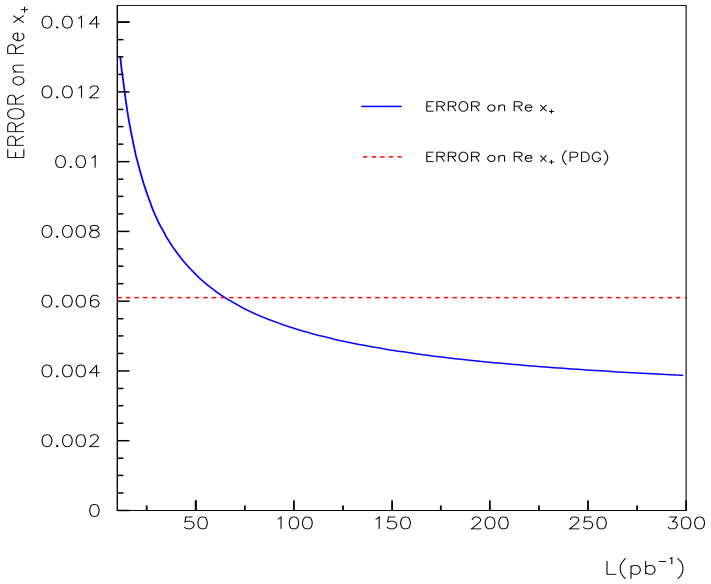
$$K_S \to \pi e \nu$$

With ~300 pb $^{-1}$:

Error on $\Gamma_S(\pi e \nu) \sim$ error on $\Gamma_L(\pi e \nu)$



Test of $\Delta S = \Delta Q$: $\Re(x_+)$ better than CPLEAR



δ_S Charge asymmetry @ 1%

$\delta_S - \delta_L \longrightarrow$ ~~CPT~~

$\delta_S + \delta_L \longrightarrow \delta\,\Re(\epsilon)/\epsilon \sim 1$

K TeV

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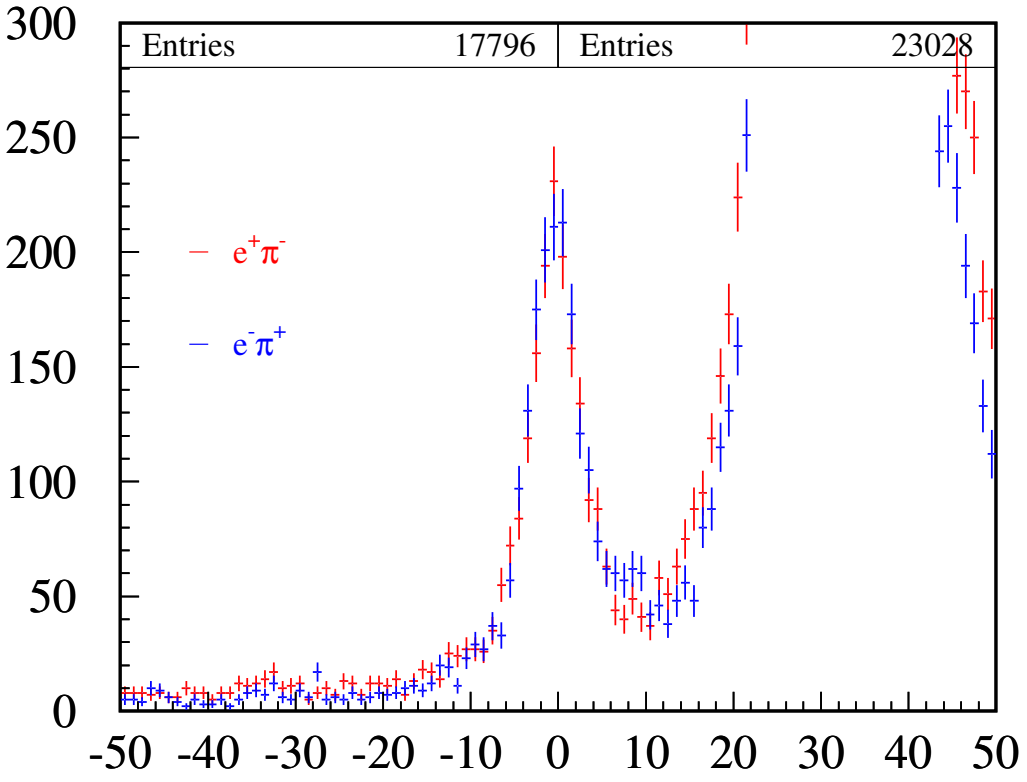
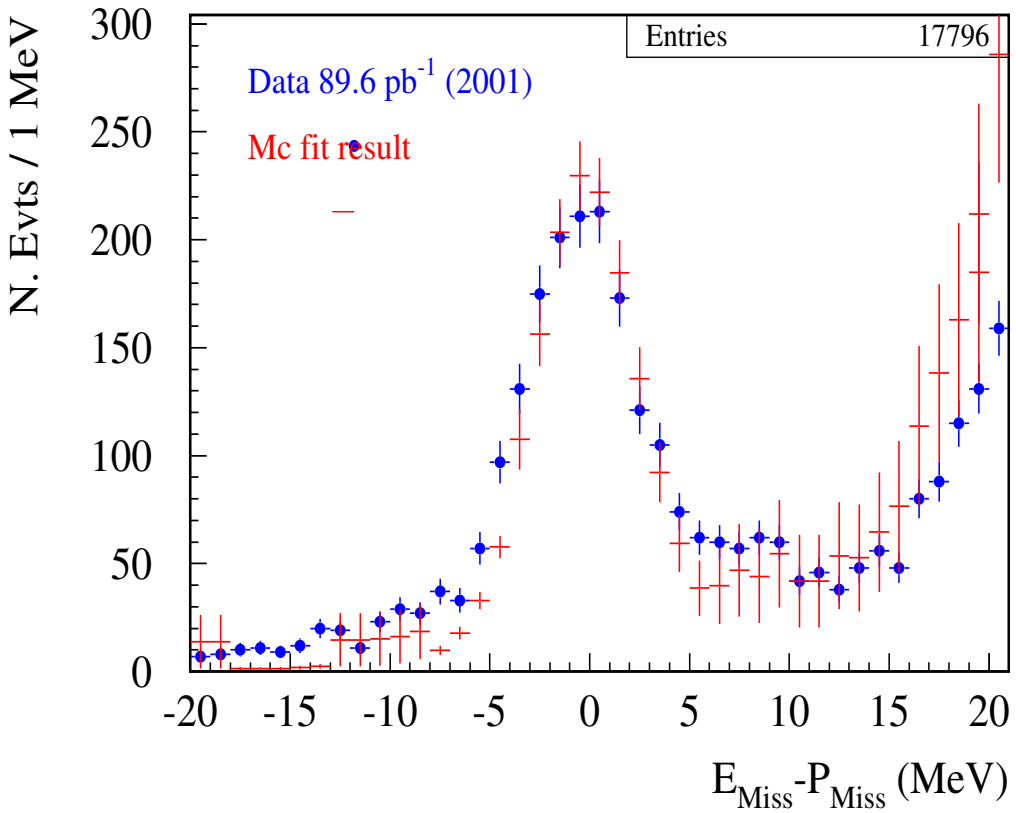
Method

- $\pi e \nu / \pi^+ \pi^-$ in events with the Kcrash tag
- PID using ToF
- Event counting from the fit to the Emiss - Pmiss distribution





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Efficiencies

Method 1:
Kl decaying before DC ➡ TCA T0 TRG ToF

Method 2:
single particle efficiencies measured from $K_L \to \pi e \nu$ before DC, $K_S \to \pi^+ \pi^-$, $\phi \to \pi^+ \pi^- \pi^0$, Klcrash and Bhabha events are used to weight the MC $K_S \to \pi e \nu$, $\pi \pi$ ➡ Acceptance TRK TCA T0 TRG and Pmiss - Emiss weighted distributions for signal and BKG.

Efficiencies

Eff	method	average	+ lepton	– lepton
Acc⊗TRK	S	(31.00±0.07)%	(30.90±0.10)%	(31.10±0.10)%
TCA	D	(92.40±0.16)%	(92.30±0.22)%	(92.50±0.22)%
	S	(92.45±0.07)%	(92.30±0.10)%	(92.60±0.10)%
T0	D	(99.74±0.03)%	(99.74±0.04)%	(99.74±0.04)%
	S	(99.75±0.01)%	(99.71±0.02)%	(99.78±0.02)%
TRG	D	(93.70±0.10)%	(93.60±0.10)%	(93.80±0.20)%
	S	(92.75±0.08)%	(93.00±0.11)%	(92.50±0.11)%
ToF	D	(79.90±0.20)%	(78.70±0.30)%	(81.10±0.30)%
TOTAL	D⊕S	(21.40±0.40)%	(21.00±0.50)%	(21.70±0.50)%

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Preliminary results on 2001 data

90 pb^{-1} year 2001

$$N^{+} = 1450 \pm 70 \qquad N^{-} = 1520 \pm 70$$

Dominated by MC statistics for Bkg

$$\delta_S = \frac{N^{+}/\epsilon^{+} - N^{-}/\epsilon^{-}}{N^{+}/\epsilon^{+} + N^{-}/\epsilon^{-}} = (0.7 \mp 3.4)\%$$

We need some time to run the analysis on data and MC for the Br evaluation.

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$$(K_S \to \pi^+\pi^-)/(K_S \to \pi^0\pi^0)$$

- Present relative error on this ratio is ($\pm$ 0.001 stat $\pm$ 0.007 syst)
- Syst error will be reduced to $\sim$1‰
- Photon energy spectrum in $\pi\pi\gamma$ decays

Selection

Kcrash tag +

$K_S \to \pi^0\pi^0$: $\geqslant$3 neutral prompt clusters E > 20 MeV + θ cut

$K_S \to \pi^+\pi^-$: 2 TRK's entering the calorimeter
120 MeV < P < 300 MeV + θ cut

Both cluster and TRK efficiencies are measured from data and used to correct MC.

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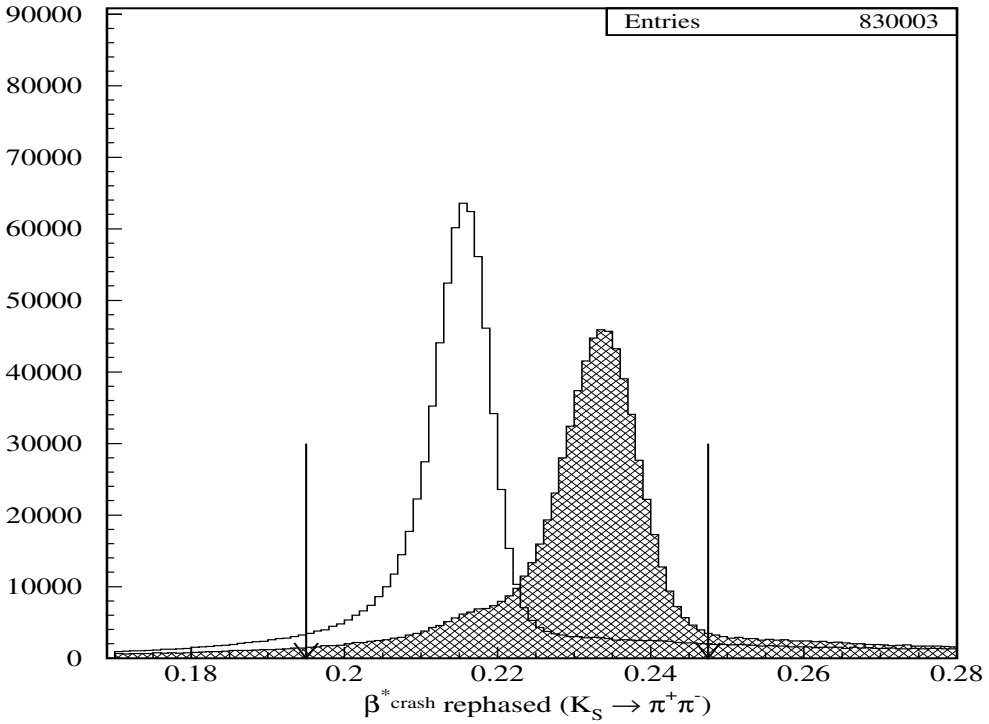
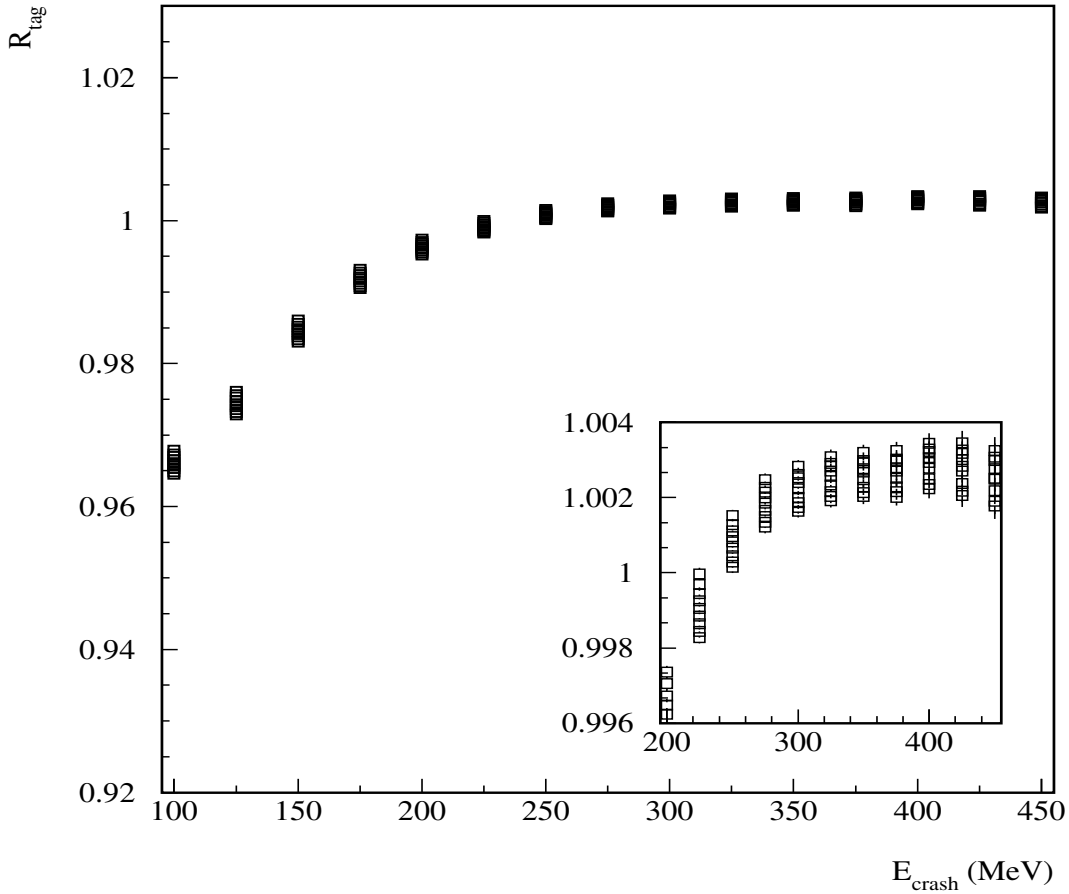
Systematics I

In 2000: Dominated by the different tagging efficiency



New window for the β^*

8 pb $^{-1}$ year 2002



Less sensitive to changes in time scale and $\sqrt{S}$.

Time scale ± 1%

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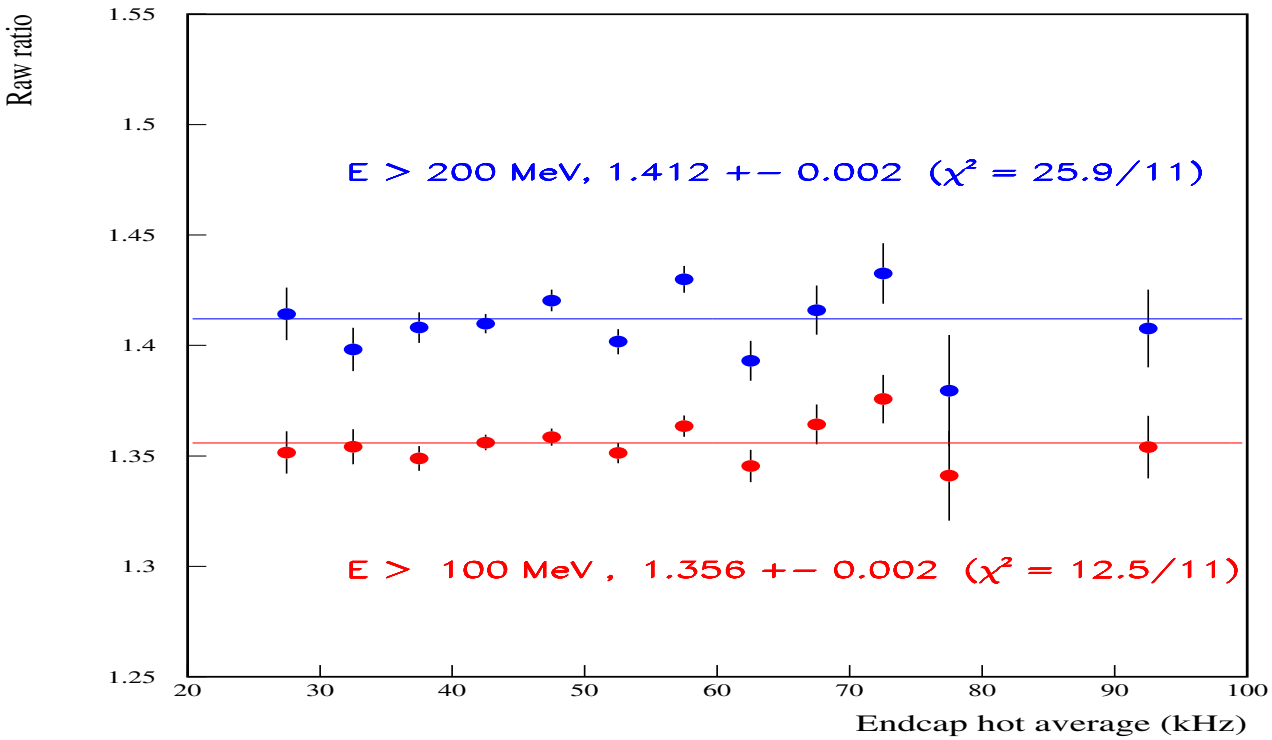
Systematics II

Study of the ratio stability for different Bkg rates



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$$K_L \to \pi^0 \pi^0$$

Method: $\dfrac{K_L \to 2\pi^0}{K_L \to 3\pi^0}$ Tag: $K_S \to \pi^+ \pi^-$

Preselection: 1 neutral vertex with 3☞5 neutral clusters, cuts on E_K and P_K .

After photon pairing the selection is done using a global fit.

$$purity \sim 90\% \qquad \epsilon \sim 60\%$$

Work is in progress to implement a new pairing technique based on a Likelihood method.

$$\frac{P(\gamma_1\gamma_2, \gamma_3\gamma_4)}{P(all\ pairings)}$$

95% correct in 2π decays

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$$K_L \to \pi^+ \pi^-$$

See talk M.Antonelli et al.: KLOE Physics Workshop, Isola D'elba, 24 May 2001