8 Configurations of Ke3 Decays

- positron or electron
- east or west vacuum beam
- + 411 or –411 MeV analysis magnet polarity

Each configuration has a partner that has an identical geometrical acceptance:

e^+ East +411 MeV $\leftrightarrow$ e^- East –411 MeV

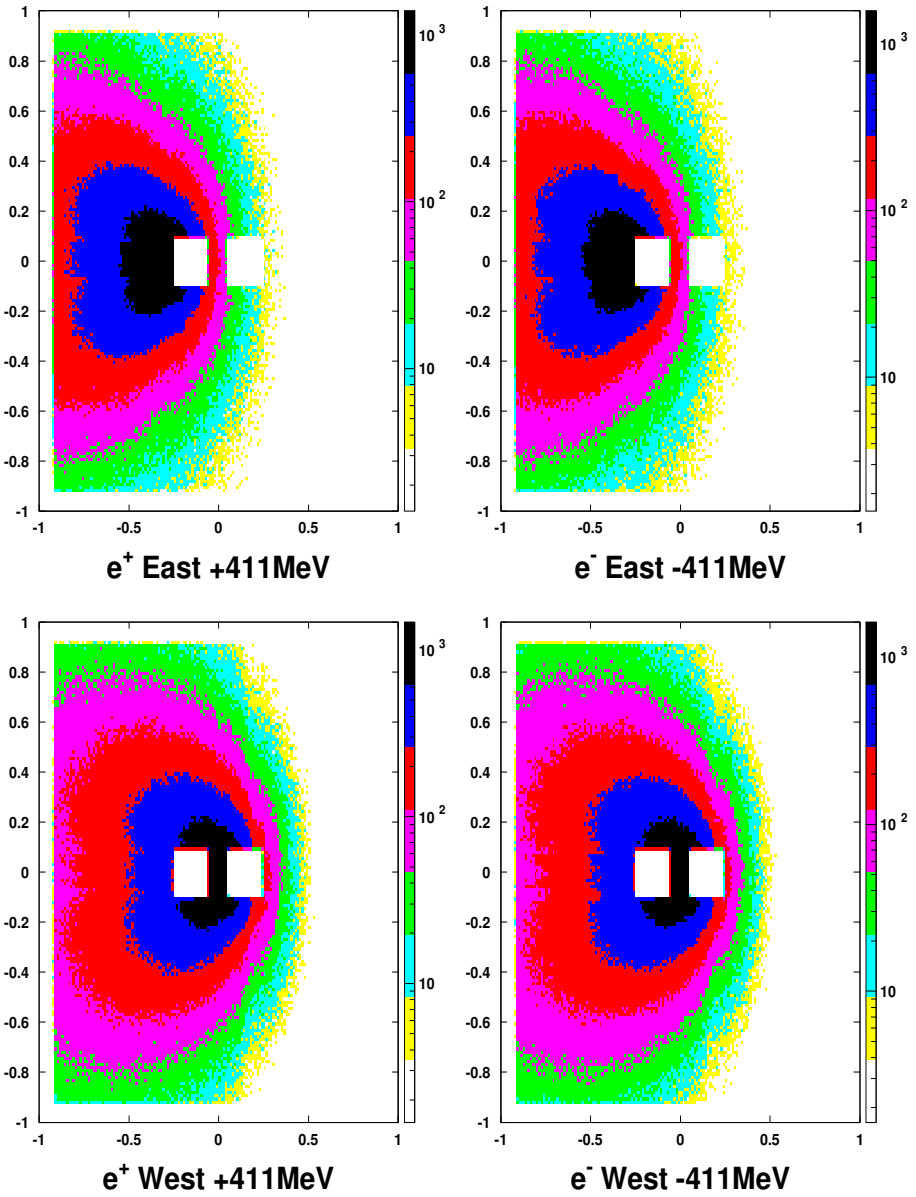
e^+ West +411 MeV $\leftrightarrow$ e^- West –411 MeV

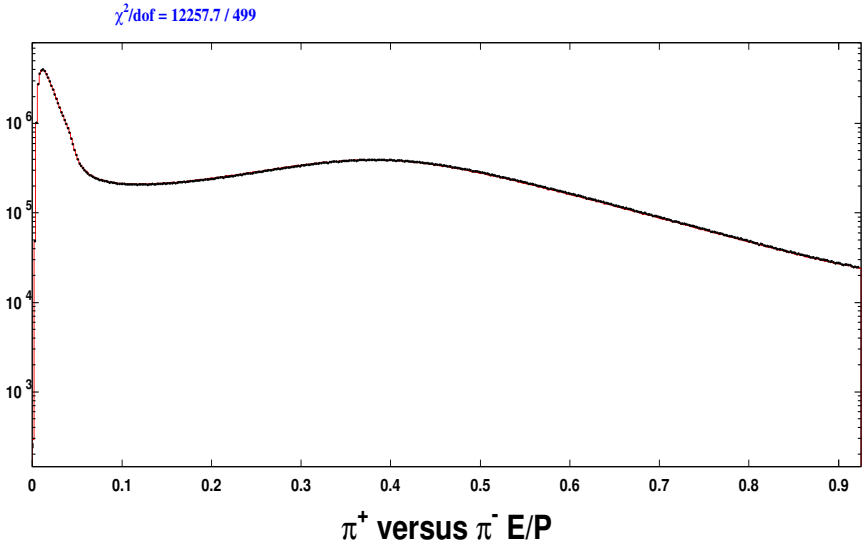
e^+ East –411 MeV $\leftrightarrow$ e^- East +411 MeV

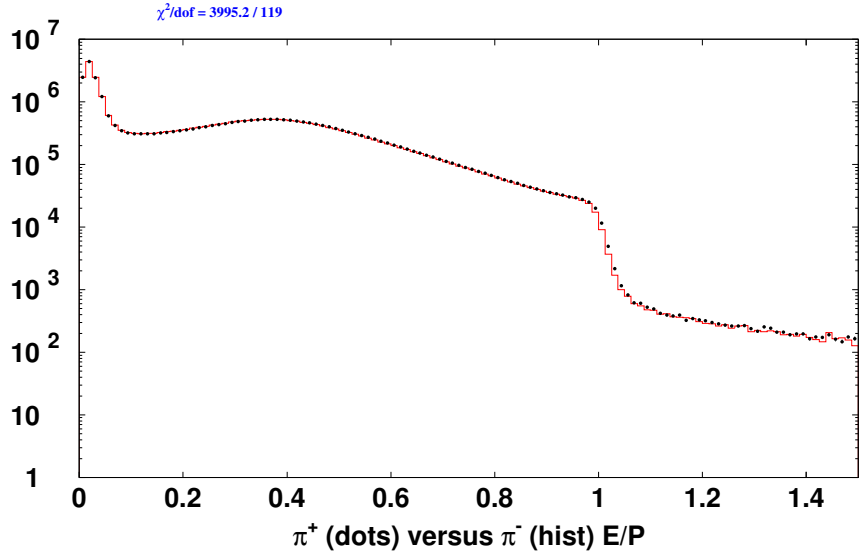
e^+ West –411 MeV $\leftrightarrow$ e^- West +411 MeV

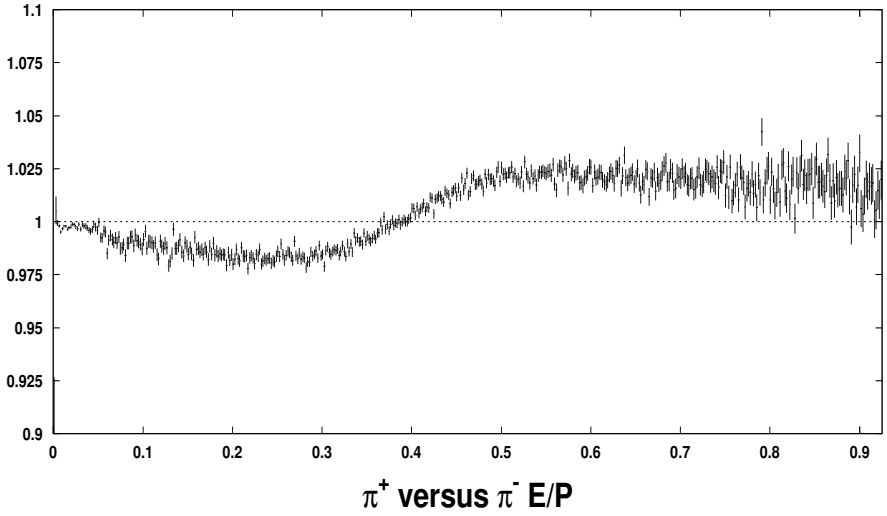
However, a given configuration and its partner do not necessarily have the same beam flux

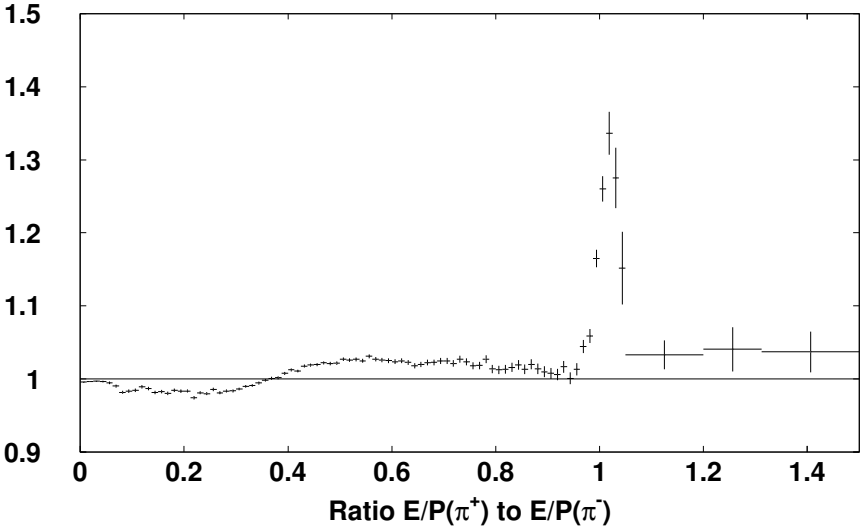
Illumination of $e^{\pm}$ at the CsI




χ²/dof = 12257.7 / 499
π⁺ versus π⁻ E/P

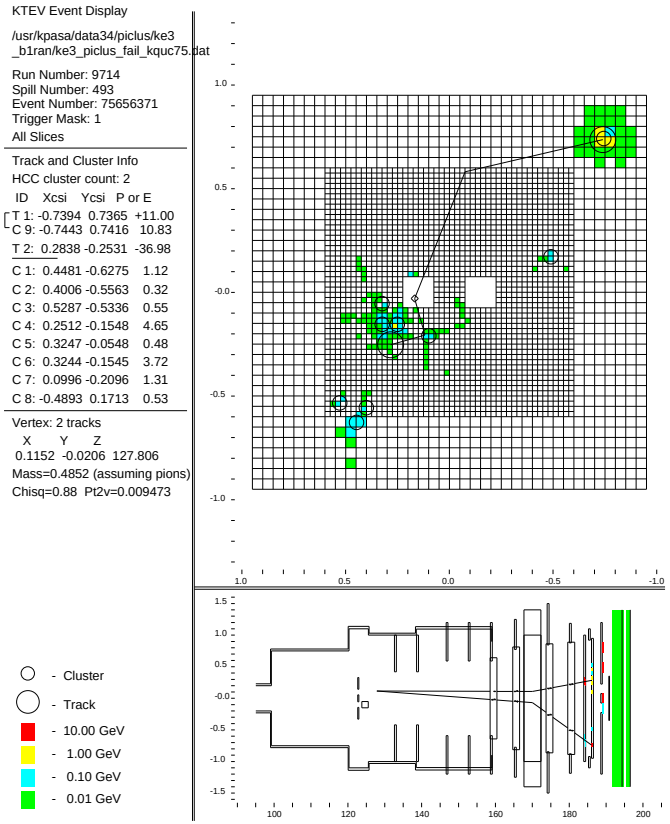

χ²/dof = 3995.2 / 119
π⁺ (dots) versus π⁻ (hist) E/P

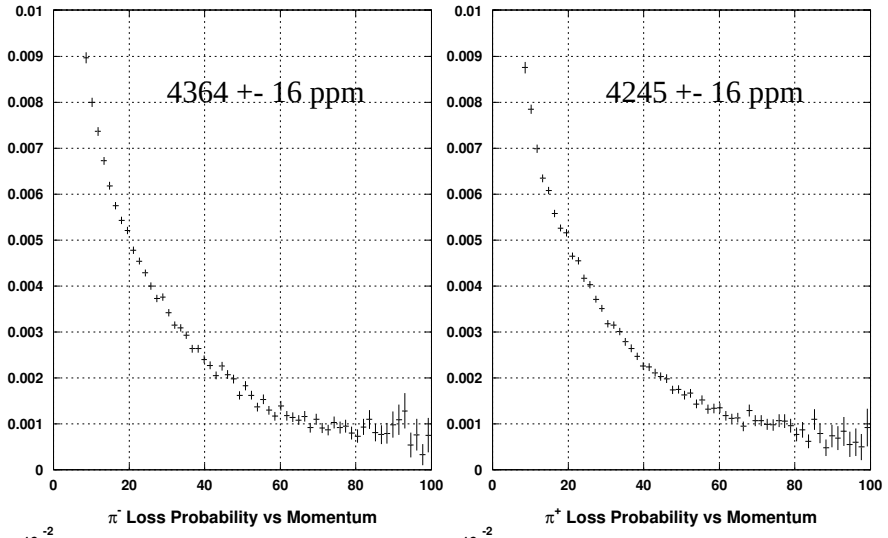

π⁺ versus π⁻ E/P

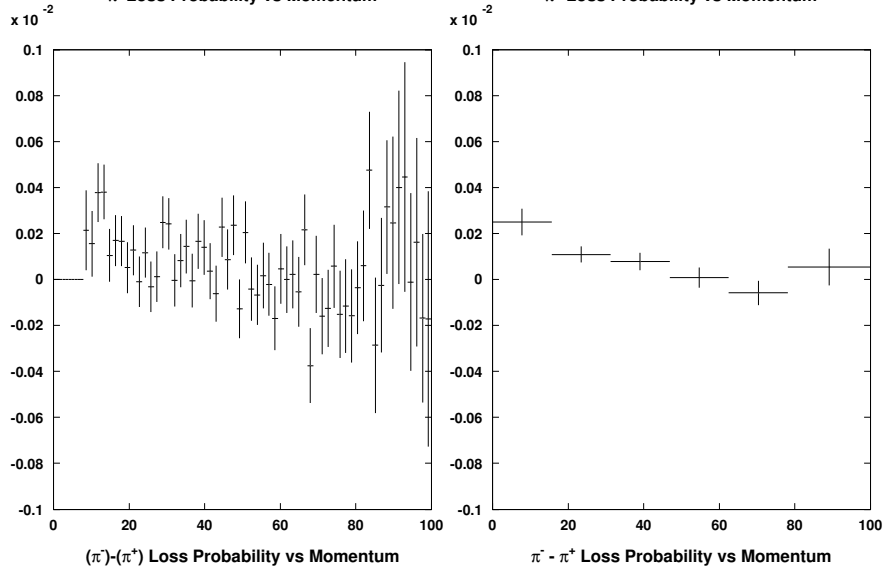

Ratio E/P(π⁺) to E/P(π⁻)

$\pi^{\pm}$ lost due to interactions in front of CsI

Correction = – 54 ± 10 ppm



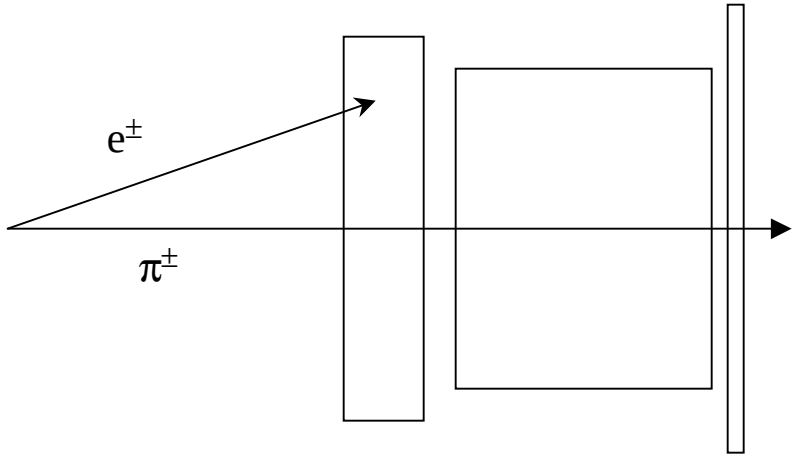




Hadronic interactions upstream of CsI, most likely in the trigger scintillators, causing failures in the matching of tracks to clusters.

$\pi^{\pm}$ Punch Through Correction

- To reduce the trigger rate, the trigger required no activity in muon veto.
- This vetoes pion decay-in-flight and punch through, which could cause a bias.



$\pi^{\pm}$ decay and punch through sample

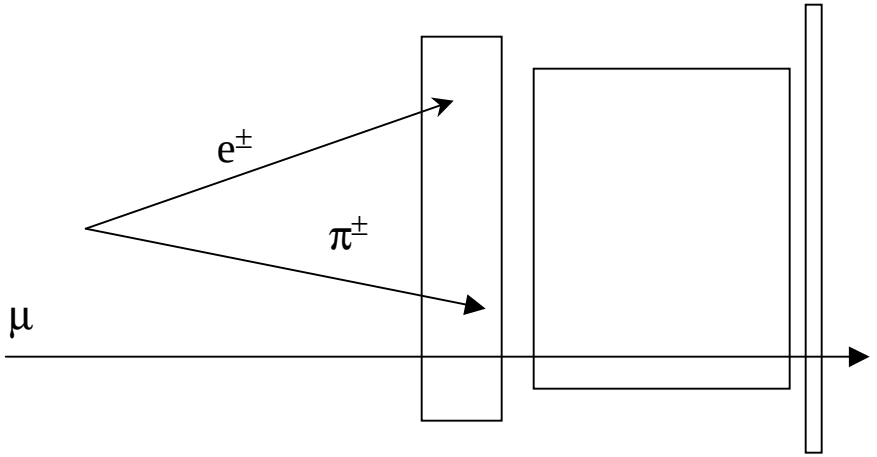
From Unbiased Trigger Sample, measure:

δ_L (decay/punch) = $(4.4 \pm 1.3) \cdot 10^{-3}$

δ_L (accidental μ) = $(3.3 \pm 1.0) \cdot 10^{-3}$

Correction = 33.6 ± 39.8 ppm

Largest systematic uncertainty for this analysis



accidental μ sample

Preliminary Result for $K_L \rightarrow \pi e \nu$ Charge Asymmetry

298 Million $K_L \rightarrow \pi e \nu$ collected in 1997 run of KTeV-E832

Raw δ_L = 3417 ± 58 ppm

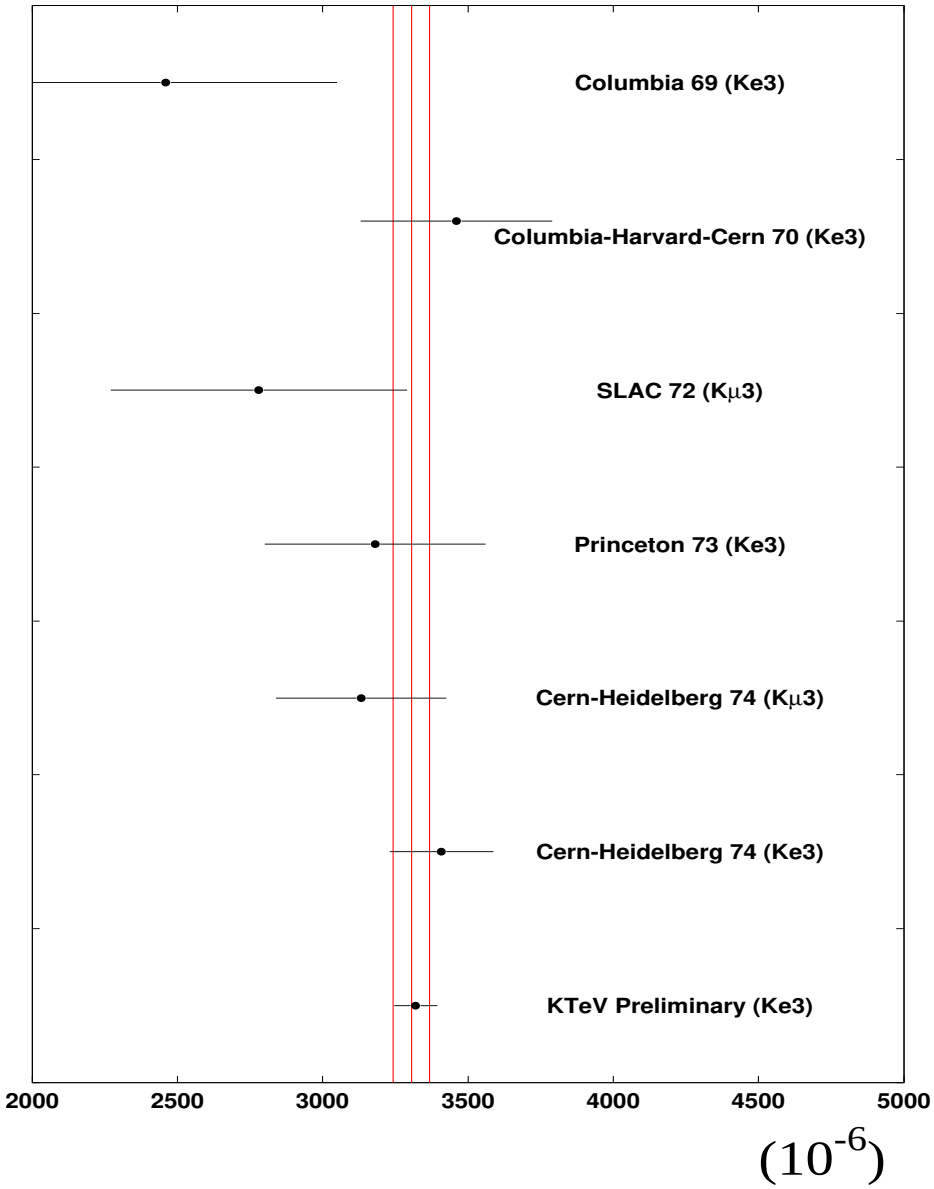
Correction = –97 ± 46 ppm

δ_L = 3320 ± 58(stat) ± 46(sys) ppm

= 3320 ± 74(comb) ppm

•2.4 x more accurate than the previous best result (CERN-Heidelberg 1974)

•Excellent agreement with all previous measurements

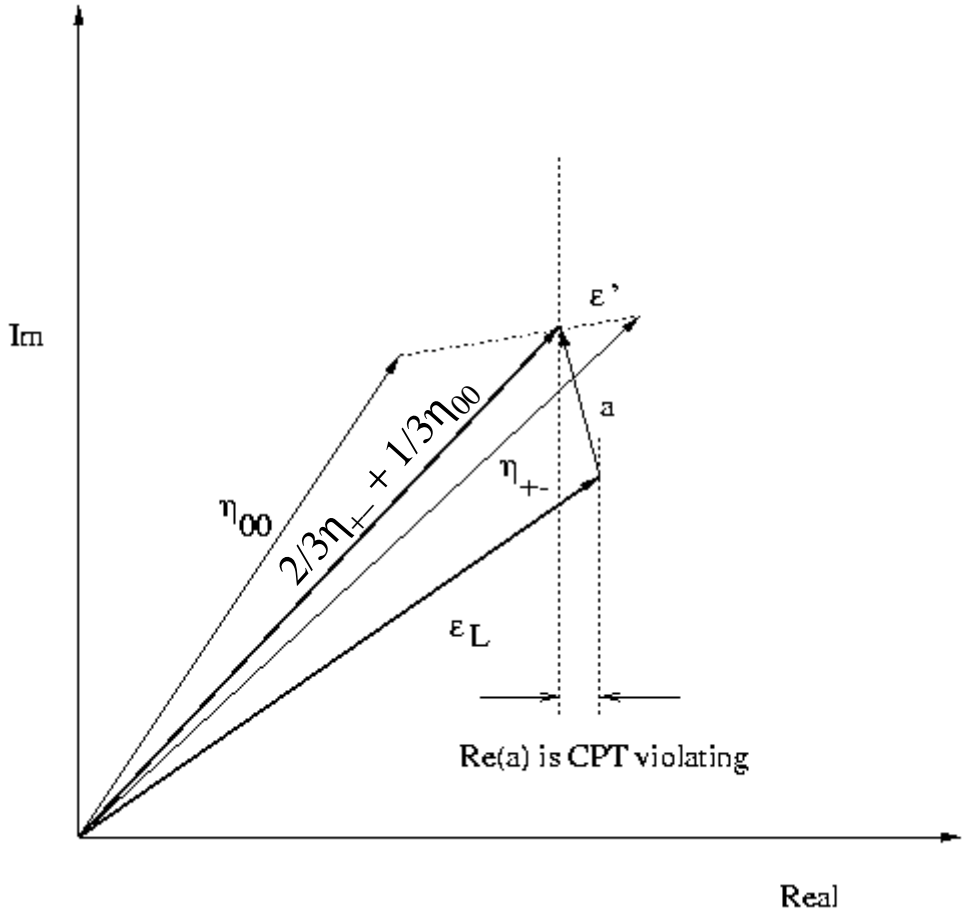


New Average: 3305 ± 63 ppm (χ^2 = 4.2/6 d.o.f.)

Comparison to $K_L \to \pi\pi$ and limit on CPT Violation

Parameter	PDG2000 averages
$\lvert\eta_{+-}\rvert$	2276 ± 17 ppm
$\lvert\eta_{00}\rvert$	2262 ± 17 ppm
ϕ_{+-}	43.5 ± 0.5 °
ϕ_{00}	43.2 ± 1.0 °
$2\mathrm{Re}(\eta_{+-})$	3302 ± 37 ppm
$2\mathrm{Re}(\eta_{00})$	3298 ± 60 ppm
δ_L	3305 ± 63 ppm

(PDG avg and this result)



$$\mathrm{Re}(a) = 2/3\ \mathrm{Re}\,\eta_{+-} + 1/3\ \mathrm{Re}\,\eta_{00} - \mathrm{Re}\,\varepsilon_L$$

$$= -2 \pm 35 \text{ ppm} \quad (\text{assuming } \Delta S = \Delta Q)$$