How Real Is a_μ^{had} Accuracy?
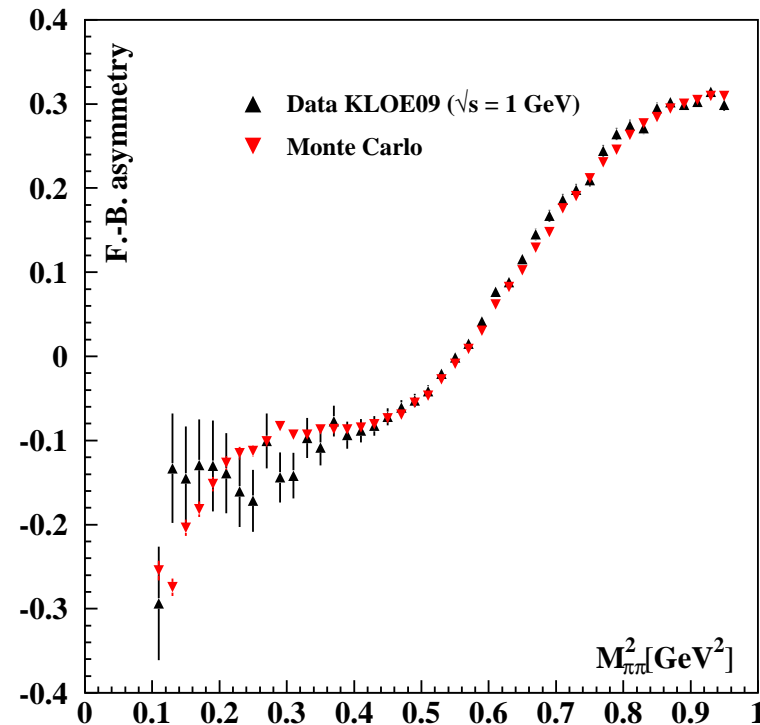
Simon Eidelman

Budker Institute of Nuclear Physics,

Novosibirsk, Russia

Outline

1. Hard thoughts

What is worrying?

- Missing states: neutrals; $\pi^+\pi^- n\pi^0, K\bar{K}n\pi$ - isospin

- New states from BaBar, double counting

- Radiative corrections (FSR): Charge asymmetry at KLOE 3k $e^+e^- \to \pi^+\pi^-\gamma$ evts at CMD-2

- Correlations

- Averaging

- Light-by-light term

- Double counting (LO and HO)

Charge asymmetry in $e^+e^- \to \pi^+\pi^-\gamma$ sQED is OK ($0.6 < M_{\pi\pi}^2 < 0.7$ GeV^2)

More detail

- Missing states: there are no measurements of:
  radiative decays of the $\rho'(\omega', \phi') \to \pi^0(\eta)\gamma$,
  7π final states or these with more pions,
  final states with $n\pi$ + a hard photon,
  final states with more than 2 π^0's

- Isospin relations as such based on Clebsch-Gordon coefficients only
  have limited applicability - dynamics with account of inteerference
  (examples of $K\bar{K}\pi$ and $K\bar{K}2\pi$)

- New final states studied by BaBar bring new problems:
  e.g., $2(\pi^+\pi^-\pi^0)$ can be $\omega\pi^+\pi^-\pi^0$ or $\eta\pi^+\pi^-\pi^0$ (something else?),
  but η decays into $\pi^+\pi^-\pi^0$ in 22.7% only,
  $\eta \to 2\gamma$ (39.3%) results in $2\gamma\pi^+\pi^-\pi^0$,
  $\eta \to \pi^+\pi^-\gamma$ (4.6%) results in $\gamma\pi^+\pi^-\pi^+\pi^-\pi^0$,
  $\eta \to \pi^0\pi^0\pi^0$ (32.6%) results in $\pi^+\pi^-4\pi^0$ (see above)