Kaon Physics and χPT Discussion

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χPT Confronts Lattice QCD
November 29 – 30 2005

Some Introductory Comments

- $\Delta S = 2$, $K \Leftrightarrow \bar{K}$ matrix elements and $\Delta S = 1$ matrix elements for $K \to \pi$ and $K \to \pi\pi$ transitions are being calculated in unquenched simulations with $m_q < m_s$.

  What is the best strategy for obtaining the results at physical m_u and m_d?

- Strategies for determining the LECs at NLO in the chiral expansion have been developed $\Rightarrow$ physical matrix elements.

  P.Boucaud et al. (SPQR Collaboration)

  J.Laiho and A.Soni

  In order to make use of these strategies we need calculations in χPT at unphysical kinematics. (Status $\sim$ NLO)

- For the calculation of $K \to \pi\pi$ matrix elements we know the expressions for the finite-volume corrections (both in the centre-of-mass frame and in *moving* frames).

  M.Lüscher; L.Lellouch and M.Lüscher; C.Lin, G.Martinelli, CTS and M.Testa

  K.Rummukainen and S.Gottlieb; C.Kim, CTS and S.Sharpe; N.Christ, C.Kim and T.Yamazaki

Some Questions for Discussion

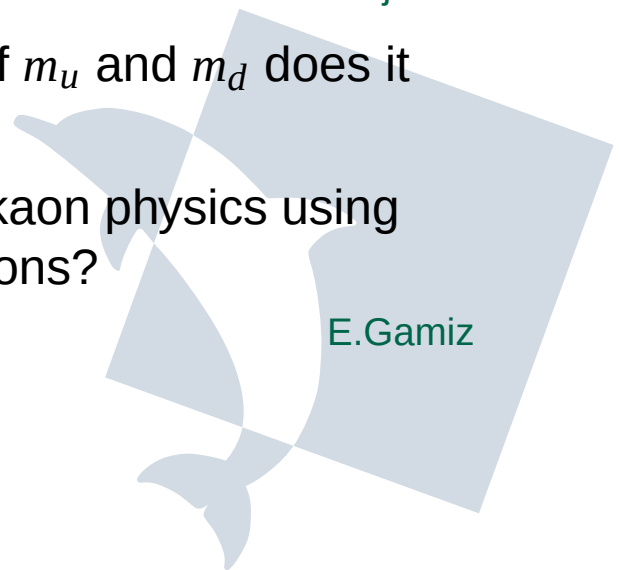
- Is (NLO, NNLO) χPT sufficiently precise to be useful?

  M.Golterman, D.Becirevic

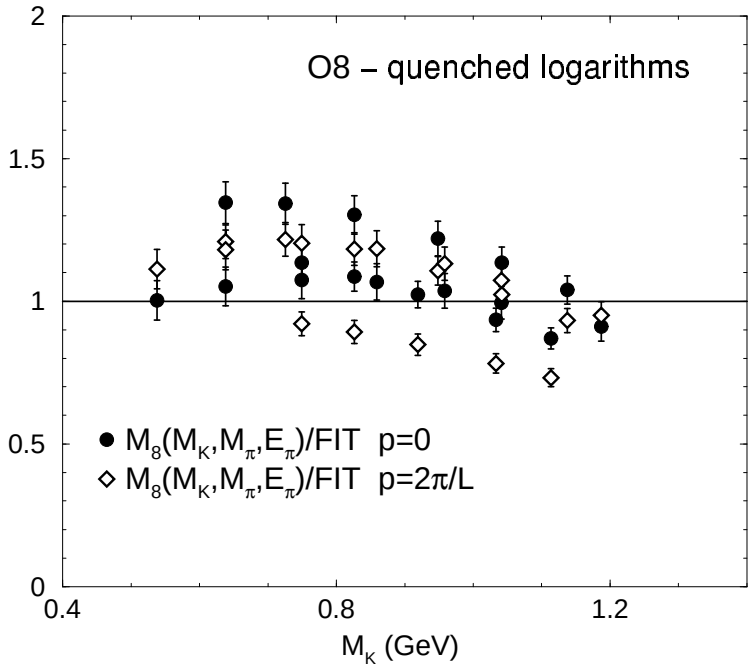
  What is the error if we fit the lattice data to χPT at NLO or NNLO?
  Is it m_K^2/Λ_χ^2 squared or cubed or ???
- What is the status of χPT calculations for such matrix elements?

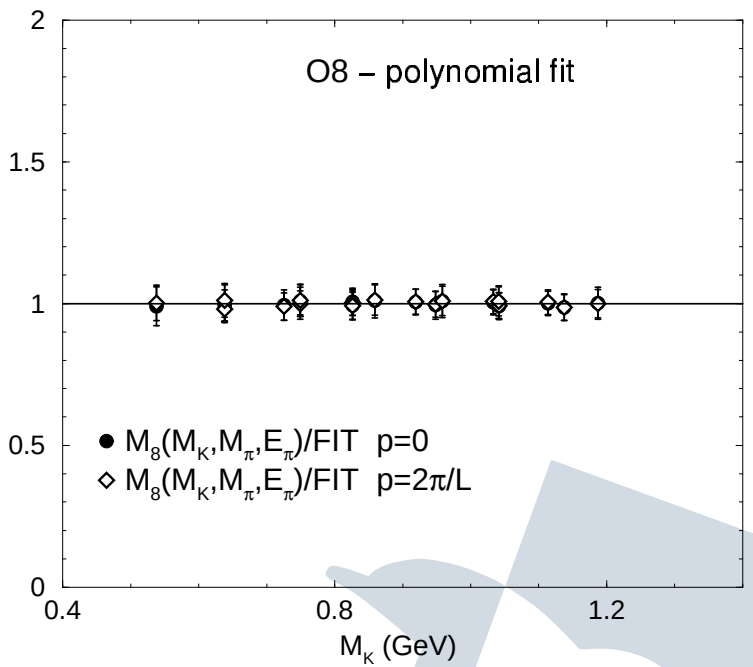
  J.Bijnens
- If χPT is a useful tool in principle, at what values of m_u and m_d does it set in?
- What are the prospects for a wider programme of kaon physics using the improved staggered formulation of lattice fermions?

  E.Gamiz



$K \to \pi\pi$ Matrix Elements of EWP Operators (Quenched)



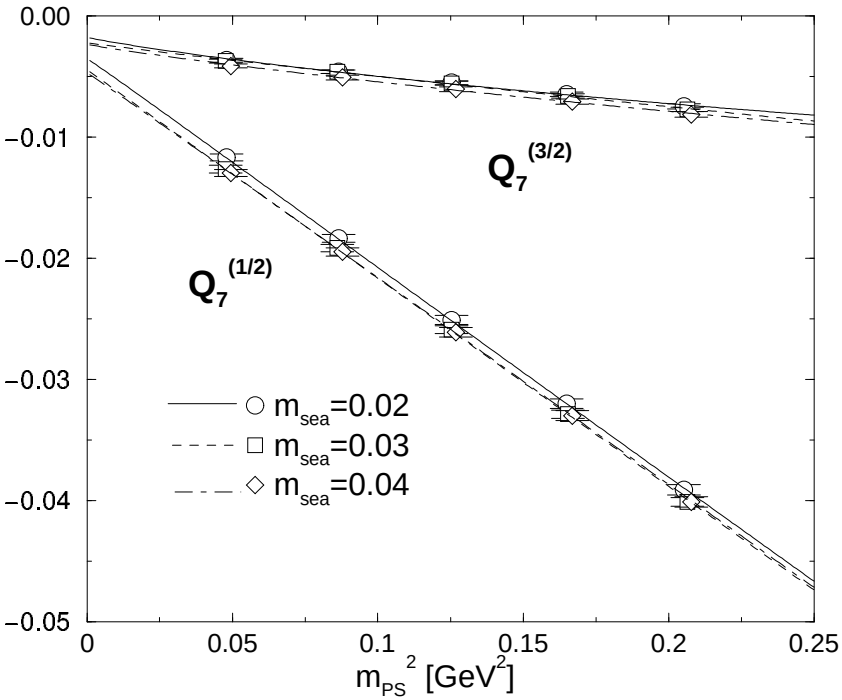


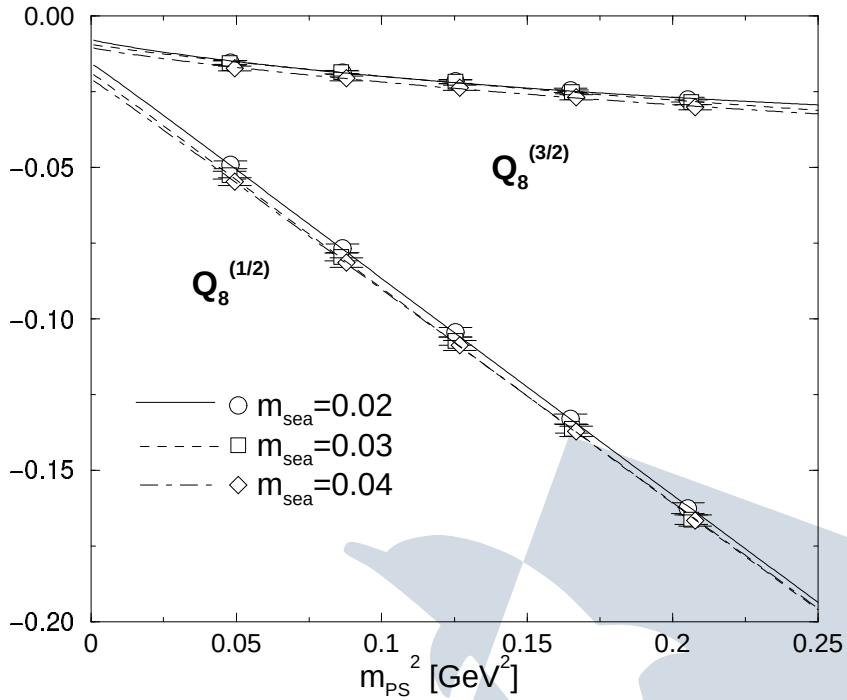
P.Boucaud et al. (SPQR Collaboration), `hep-lat/0412029`

Quenched Improved Clover + Plaquette action.

$0.5\,\text{GeV} < m_\pi < 1\,\text{GeV}$

$K \to \pi$ Matrix Elements of EWP Operators

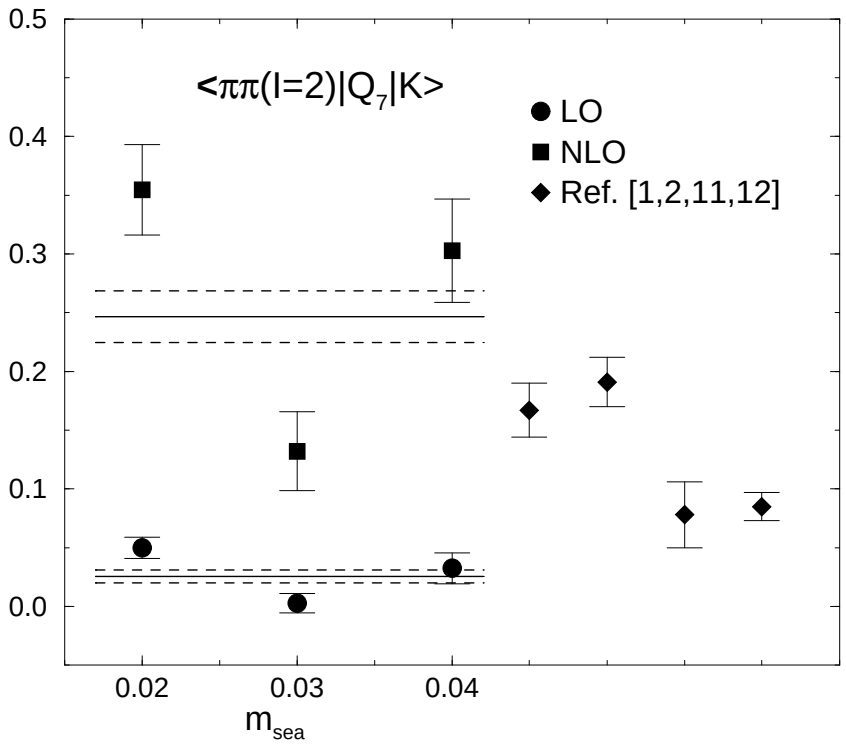


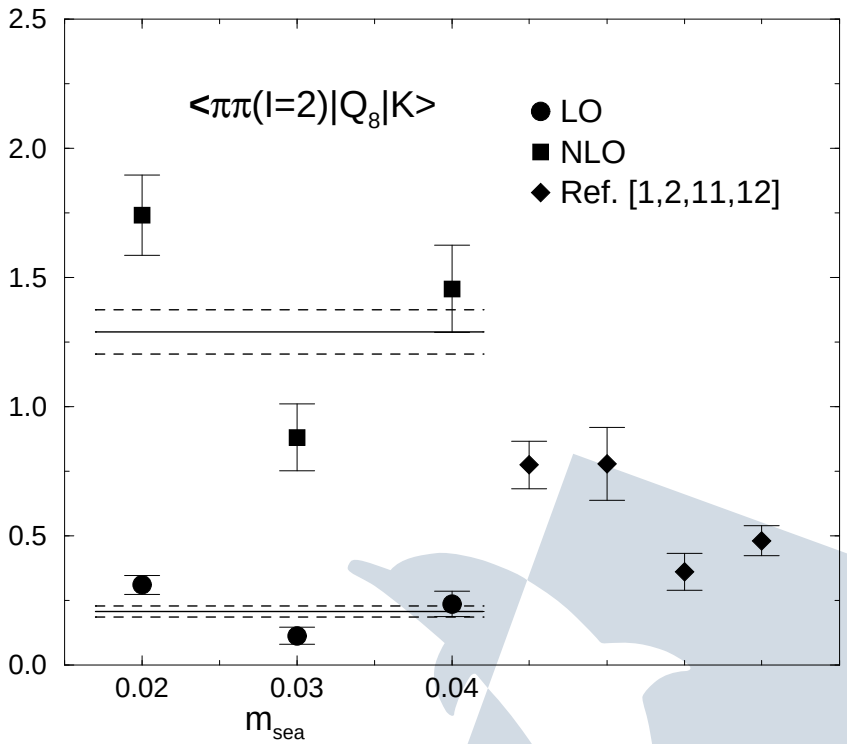


J.Noaki, `hep-lat/0510019`

$N_f = 2$ Domain Wall Fermion & DBW2 action.

$\Delta I = 3/2$ Matrix Elements of EWP Operators





J.Noaki, `hep-lat/0510019`

$N_f = 2$ Domain Wall Fermion & DBW2 action.