Kaon Sections

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A picture of our work

12 papers analysed, 22 encodings

Still data analysed from
KLOE, KTeV, NA48

waiting for KOTO, NA62

NA62's first run started in October 2014. 2015–2017 NA62 will collect a sample of 10^{13} K^+ decays containing about 100 $K^+ \to \pi^+\nu\nu^-$ events.

KOTO is expected to resume in early 2015
KOTO's SES is expected 8×10^{-12}, corresponding to 3.5 SM events

S/*B* ratio is 1.4,

MiniReviews

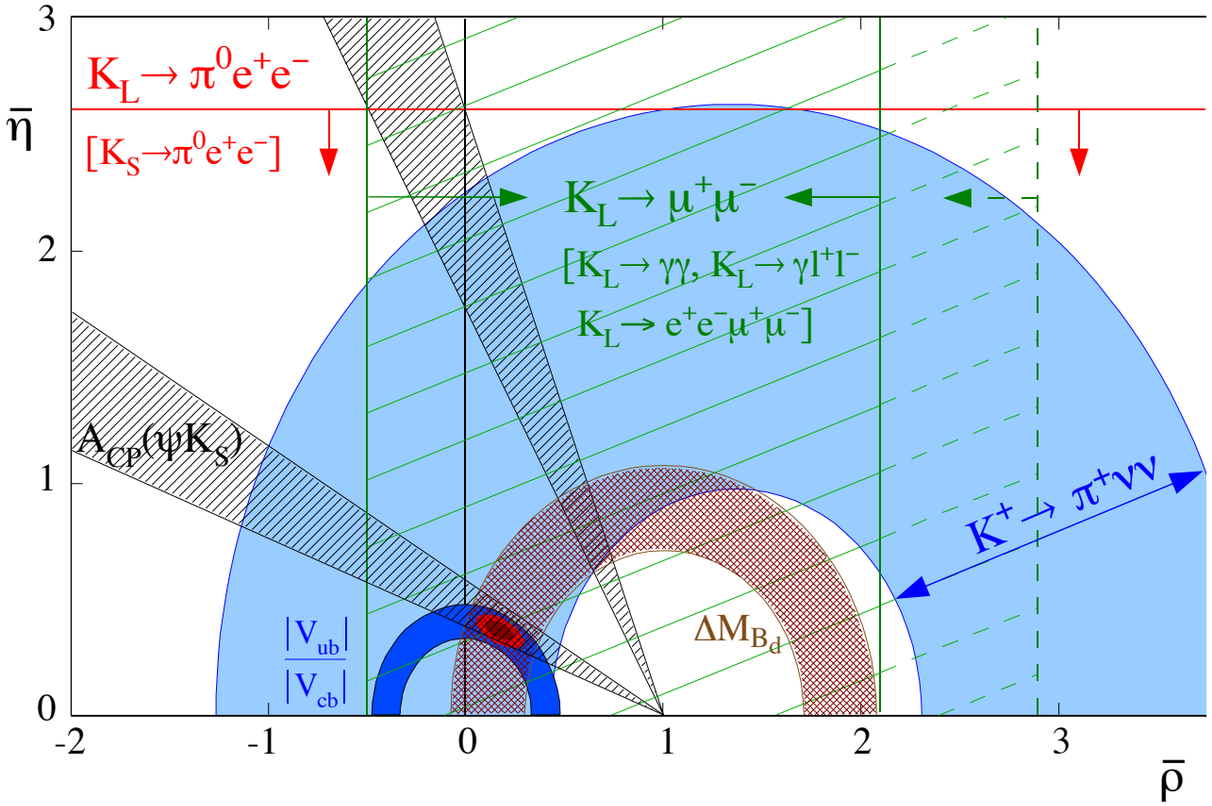
- Rare Kaon Decays (Littenberg Valencia)_
- K(l3)+- and K(l3)0 Form Factors (Lin Trippe)
- CPT Invariance Tests in Neutral Kaon Decay (Antonelli, G.D.)
- CP-Violation in KS -> 3pi (Nakada,Wolfenstein)
- V(ud), V(us), Cabibbo Angle, and CKM Unitarity (Blucher, Marciano)
- CP-Violation in KL Decays (Wolfenstein, Lin Trippe)

Highlights $K_S \to \mu\overline{\mu}$ LHCB

After 40 years improvement by 3 orders of magnitudes from LHCB

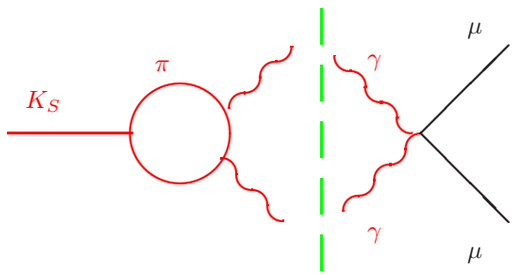
$$B(K_S \to \mu\overline{\mu}) < 11 \times 10^{-9}$$

95% CL



SM

$\sim 5 \times 10^{-12}$



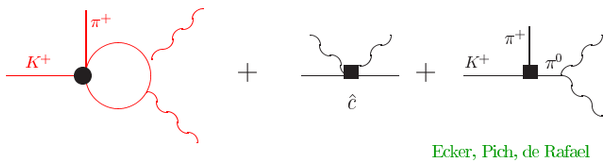
SD 1.5 10^-12

NP 1.5 10^-11
Allowed

NP Limits from CPviol in $K_L \to \mu\mu$

$K^+ \to \pi^+\gamma\gamma$ NA48/2 + NA62

Auxiliary channel useful to assess the CP conserving contribution to $K_L \to \pi^0 ee$

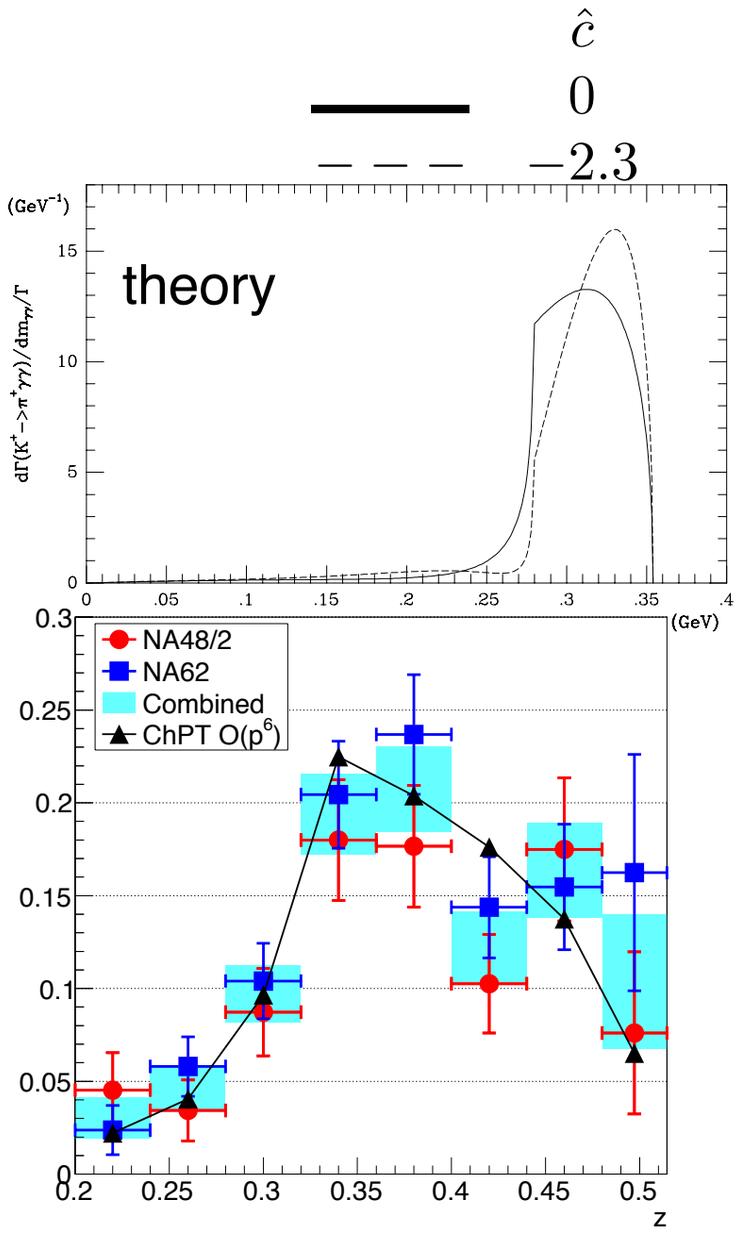


Ecker, Pich, de Rafael

Final 381 evts NA48/2 + NA62 during a 3-day special NA48/2 run in 2004 and a 3-month NA62 run in 2007

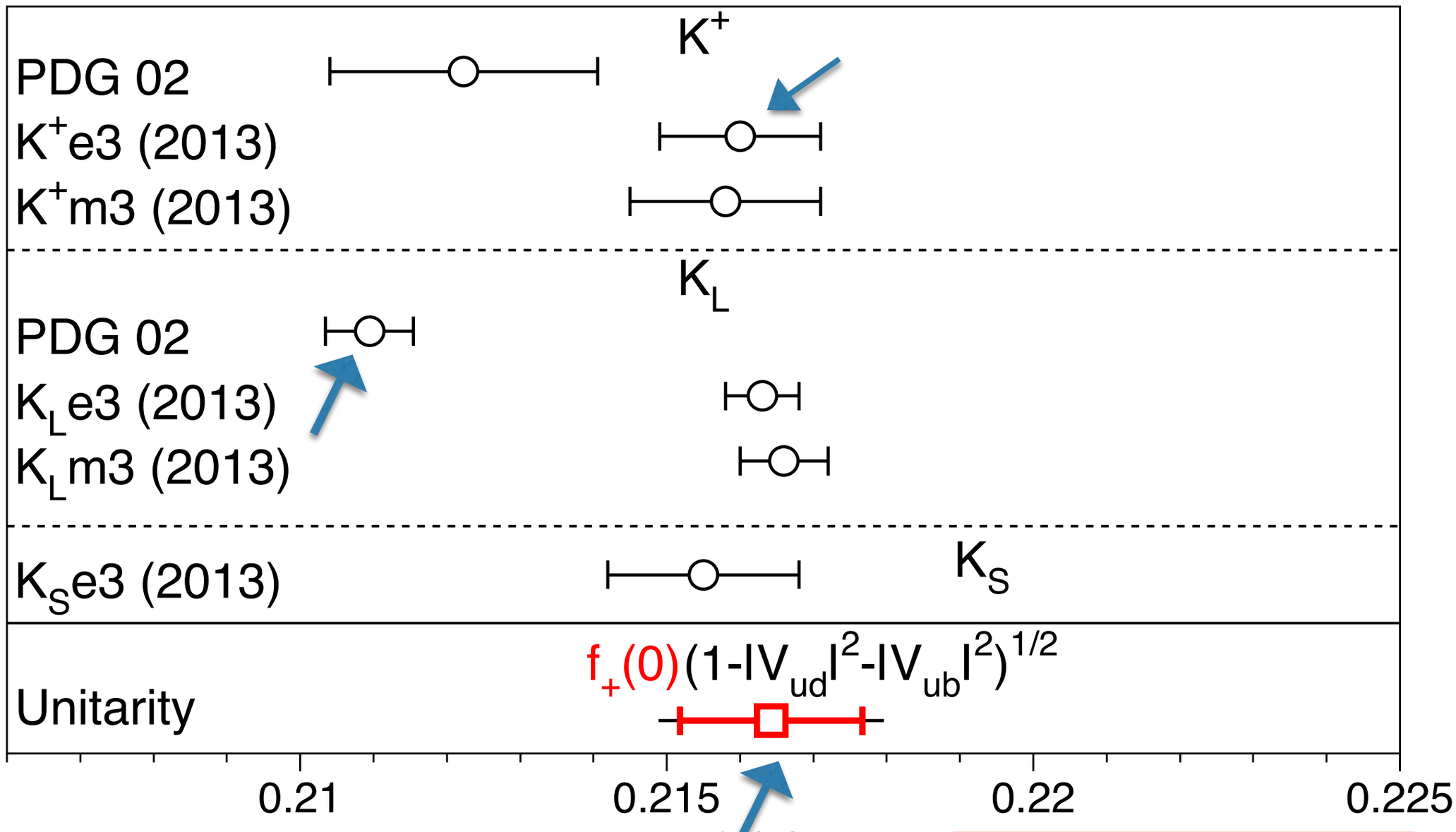
$$B = (1.003 \pm 0.051_{\text{stat}} \pm 0.024_{\text{syst}}) \cdot 10^{-6}$$

$$\boxed{\hat{c} = 1.86 \pm 0.26}$$



V_{us} rev Blucher Marciano

Important feedbacks/interactions from HFAG,
Lattice, Flavianet , other PDG reviews



superallowed +neutron beta

error: Rad corr electroweak radiative corrections, nuclear structure, and isospin violating nuclear effects

NP >10 TeV

High Statistics Measurement of the $K^+ \to \pi^0 e^+ \nu$ (K^+_{e3}) Branching Ratio

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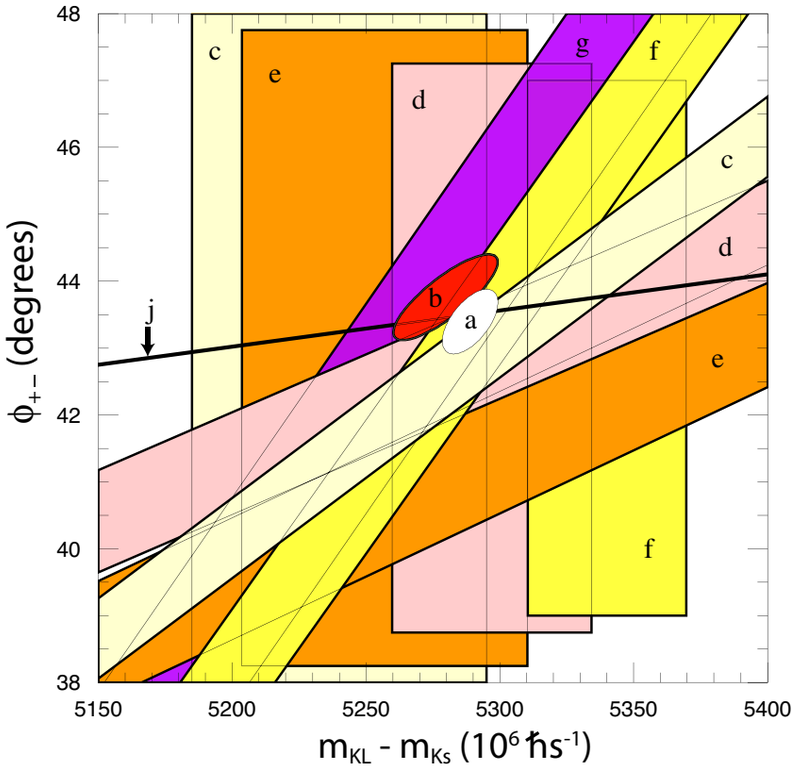
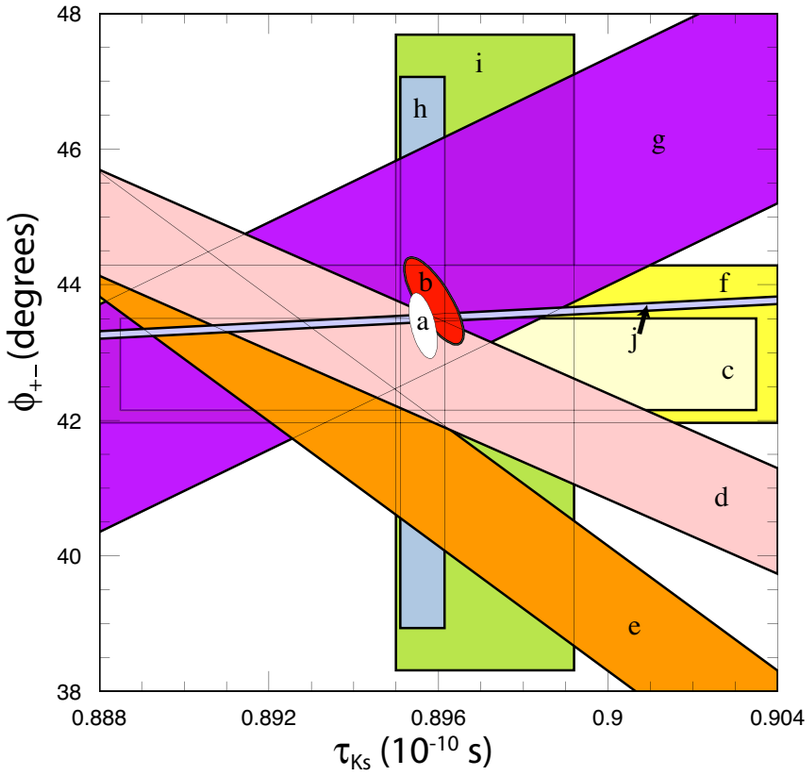
Role of KTeV, KLOE, Istra

CP-Violation in KL Decays Wolfenstein, Lin Tripe



do not assume CPT invariance



assume CPT invariance

$$\phi_{+-} - \phi_{00} \sim 0.006^{\circ} \pm 0.008^{\circ} \quad \tau_{K_S} = 0.8954 \pm 0.0004 \cdot 10^{-10} s$$

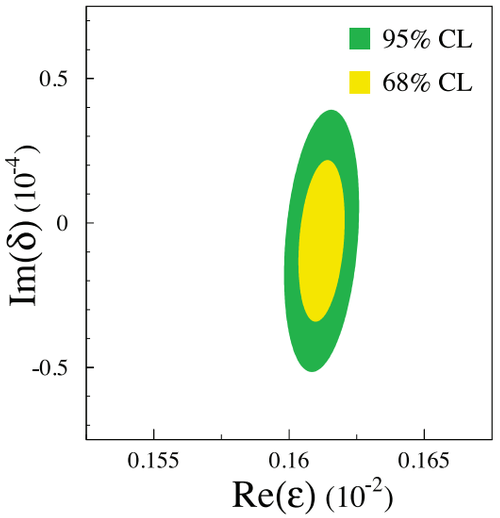
CPT Invariance Tests in Neutral Kaon Decay Antonelli, G.D.

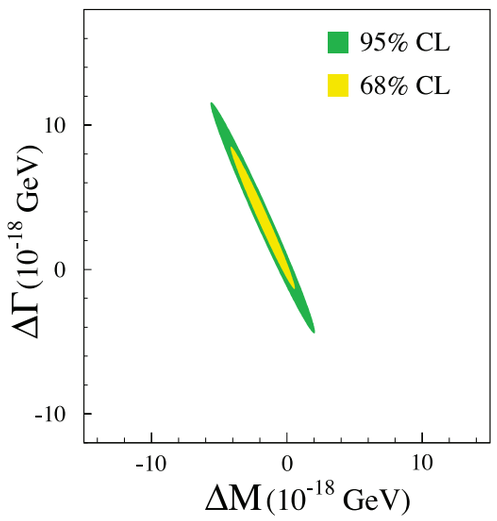
Review Bell-Steinberger relations: unitarity determines CP and CPT violating $\Re(\epsilon)$ $\Im(\delta)$ in terms of $A_L(f)A_S^*(f)$

$$\left[\frac{\Gamma_S+\Gamma_L}{\Gamma_S-\Gamma_L}+i\tan\phi_{\rm SW}\right]\left[\frac{\Re(\epsilon)}{1+|\epsilon|^2}-i\Im(\delta)\right]=\frac{1}{\Gamma_S-\Gamma_L}\sum_f A_L(f)A_S^*(f)$$

CPLEAR, NA48, KLOE, PDGfit, KTEV

$$|m_{K^0}-m_{\overline{K}^0}|<4.0\times10^{-19}\ \text{GeV}\quad\text{at 95 \% C.L.}$$





Issues

- Still to improve: maybe some form factors can be removed
- Do we need a mini review for CHPT?