

Challenges and impact of the lattice on hadron phenomenology in the near future



*XI Quark Confinement and
the Hadron Spectrum Saint-Petersburg
September 8-12 2014*



International School for Advanced Studies



$\sin 2\beta$ is measured directly from $B \rightarrow J/\psi K_s$ decays at Babar & Belle

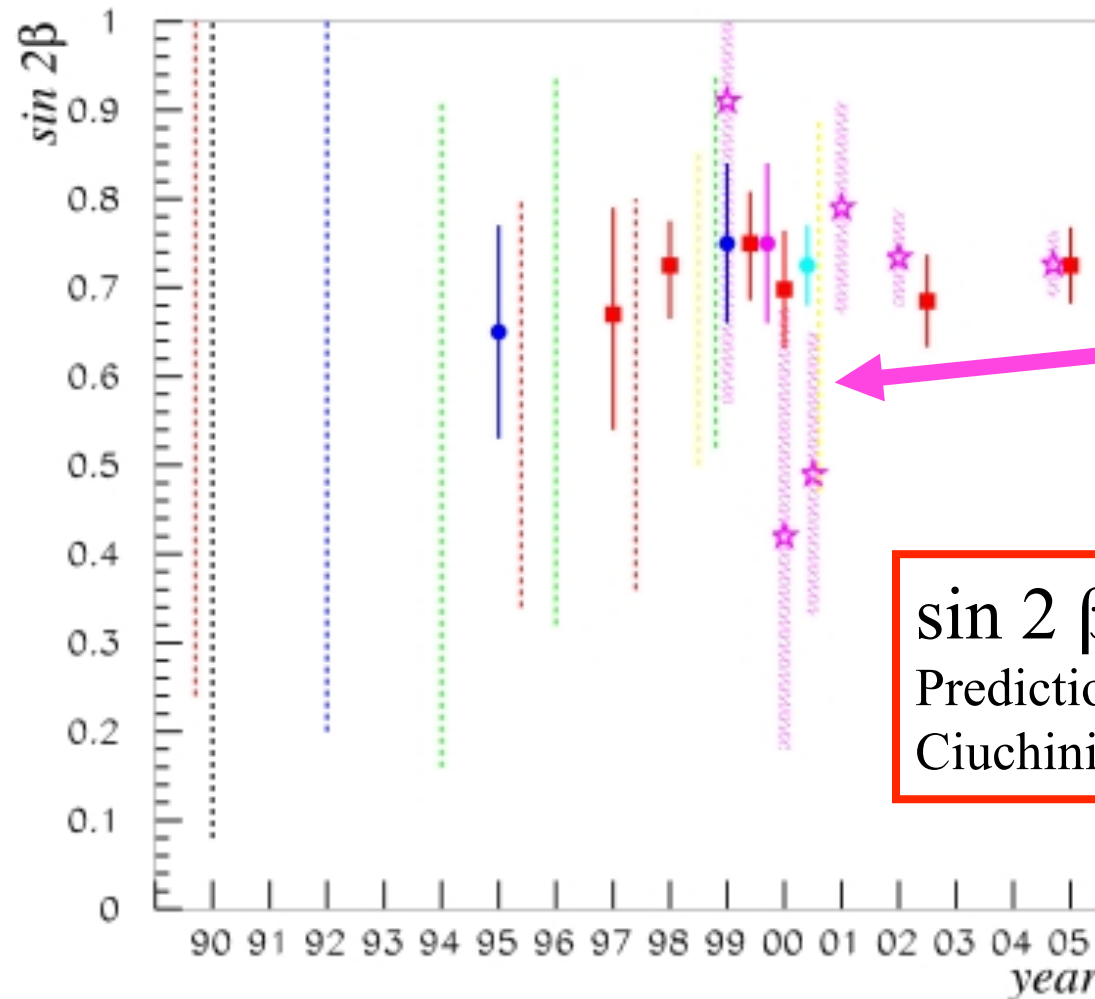
$$\mathcal{A}_{J/\psi K_s} = \frac{\Gamma(B_d^0 \rightarrow J/\psi K_s, t) - \Gamma(\bar{B}_d^0 \rightarrow J/\psi K_s, t)}{\Gamma(B_d^0 \rightarrow J/\psi K_s, t) + \Gamma(\bar{B}_d^0 \rightarrow J/\psi K_s, t)}$$

$$\mathcal{A}_{J/\psi K_s} = \sin 2\beta \sin(\Delta m_d t)$$

slide from around 2000

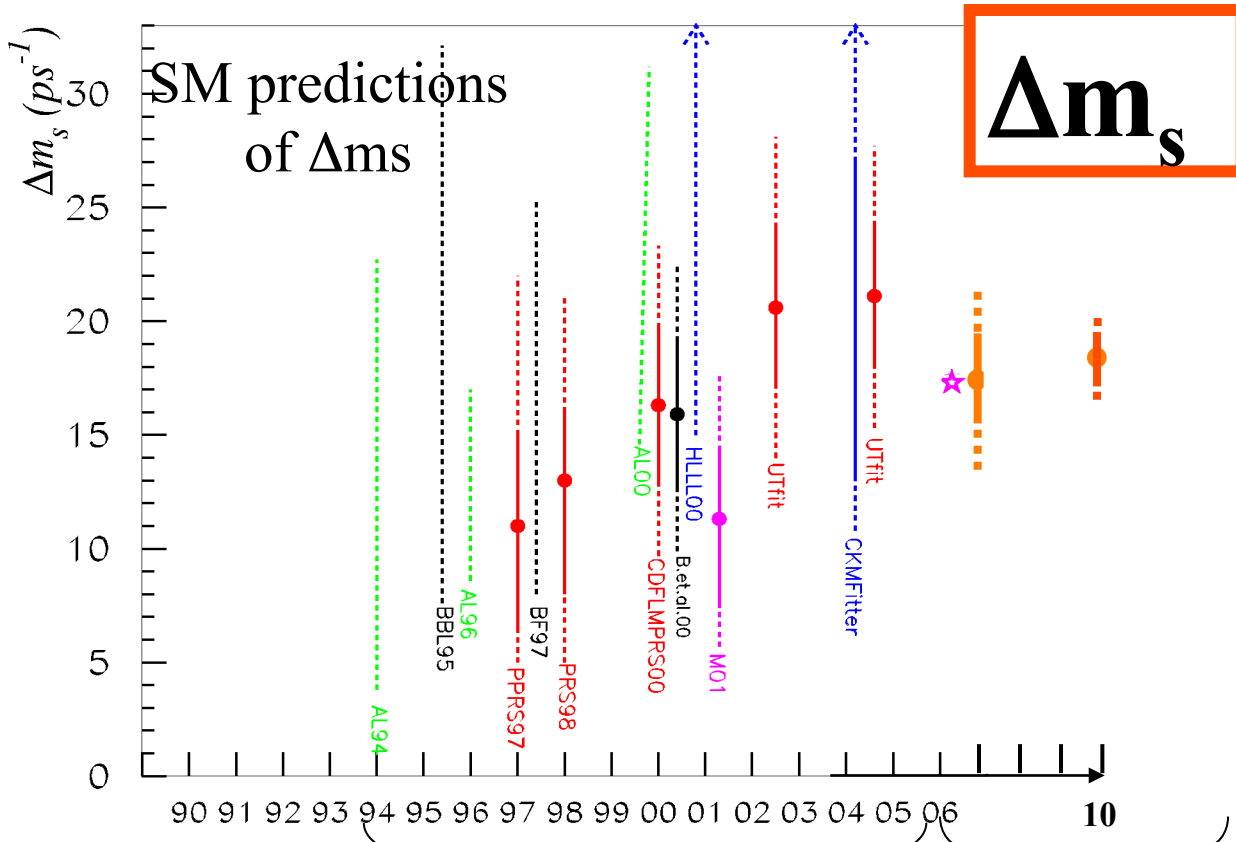
Theoretical predictions of $\sin 2\beta$ in the years

predictions
exist since '95

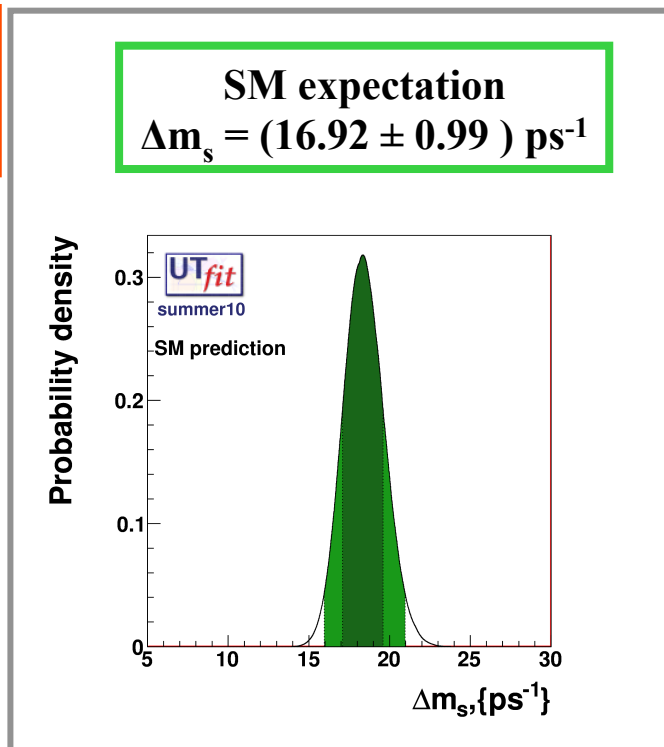


experiments

$\sin 2\beta_{\text{UTA}} = 0.65 \pm 0.12$
Prediction 1995 from
Ciuchini, Franco, G.M., Reina, Silvestrini

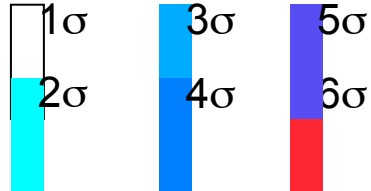


Δm_s



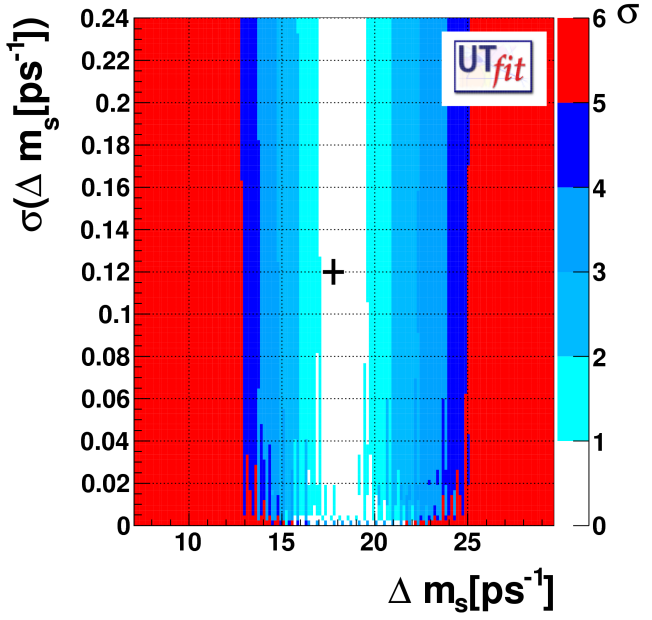
Exp
 $\Delta m_s = (17.72 \pm 0.04) \text{ ps}^{-1}$

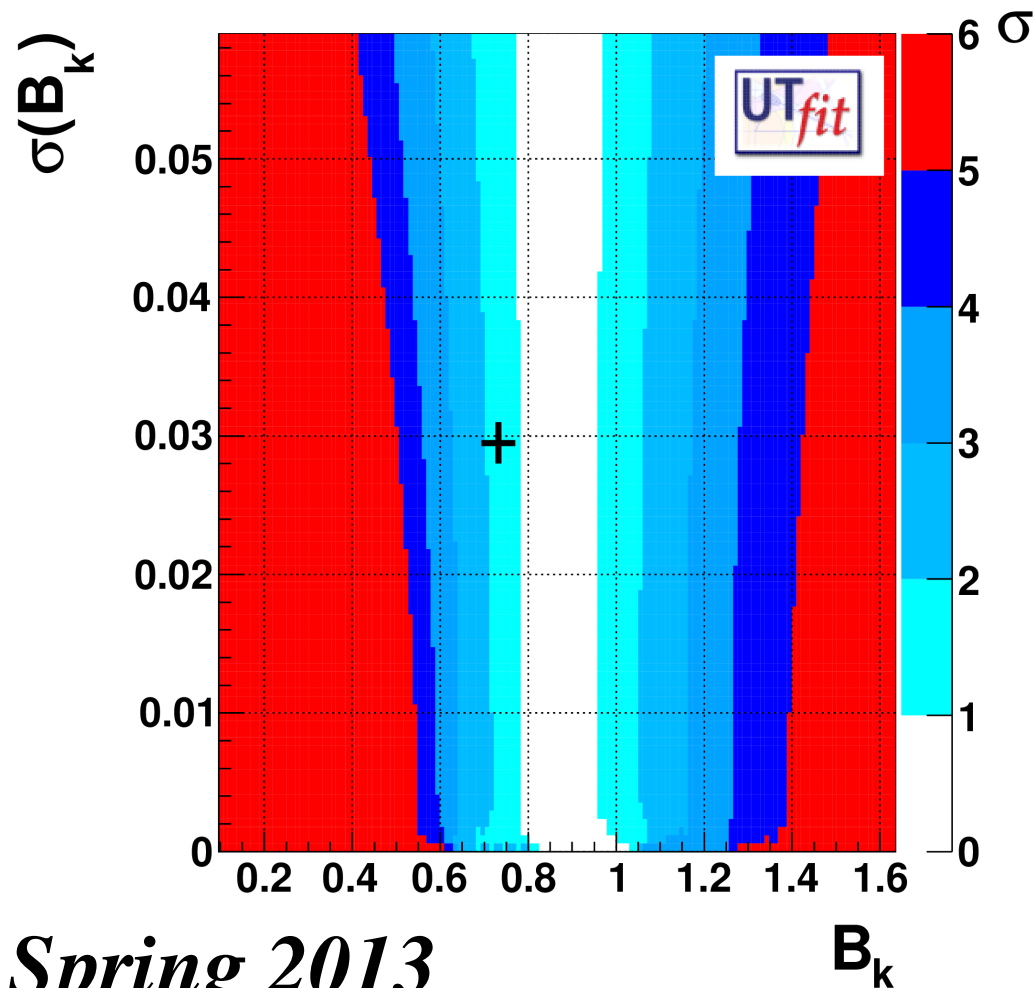
Legenda



Prediction "era"

Monitoring "era"





Spring 2013

$B_{K \text{ lattice}} = 0.733 \pm 0.029$
 update FLAG value
 $B_{K \text{ lattice}} = 0.766 \pm 0.011$

$B_{K \text{ fit}} = 0.836 \pm 0.078$

A. Buras, D. Guadagnoli, G. Isidori
Phys.Lett. B688 (2010) 309-313,
e-Print: arXiv:1002.3612 [hep-ph]

**NEED A BETTER
 CONTROL OF
 Δ_{QCD}/m_c
 CORRECTIONS**

A larger value of $|V_{cb}|$ would reduce the deviation:

$|V_{cb}|_{\text{excl}}: 1.5 \sigma \rightarrow 1.1 \sigma$