Thirty years+ connecting theory to data

Festcolloquium Ahmed Ali

Ahmeds office

DESY Theory Workshop 2009

Ahmed in Hamburg – directions

– late 70ies e^+e^- physics at DESY $\rightarrow$ Talk by G.Kramer

– mid 80ies $B\bar{B}$ mixing (discovery 1987 ARGUS@DESY)

– early 90ies Rare B Decays $\rightarrow$ Talk by T.Mannel

– these years e^+e^- physics at Belle

A Tetraquark interpretation of the BELLE data on the anomalous Upsilon(1S) pi+pi- and Upsilon(2S) pi+pi- production near the Upsilon(5S) resonance.
Ahmed Ali, Christian Hambrock (DESY), M.Jamil Aslam (Quaid-i-Azam U.). DESY-09-222. Dec 2009. 4 pp.
Published in **Phys.Rev.Lett. 104 (2010) 162001**
e-Print: **arXiv:0912.5016 [hep-ph]**

DESY Theory Workshop 2009

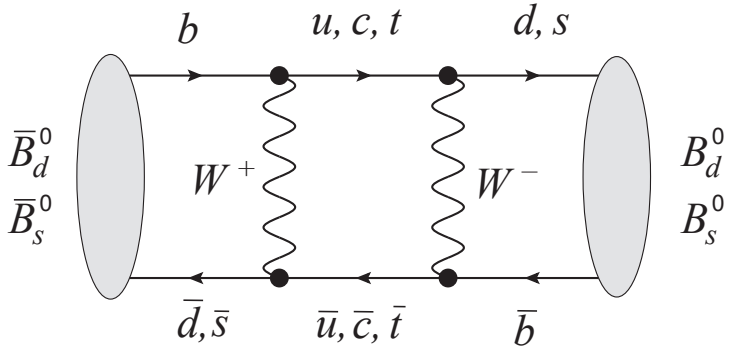
AN O (alpha-s2) CALCULATION OF ENERGY-ENERGY CORRELATION IN e+ e- ANNIHILATION AND COMPARISON WITH EXPERIMENTAL DATA.**

Ahmed Ali (DESY), F. Barreiro (Siegen U.). DESY 82/033. Jun 1982. 19 pp.
Published in **Phys.Lett. B118 (1982) 155**

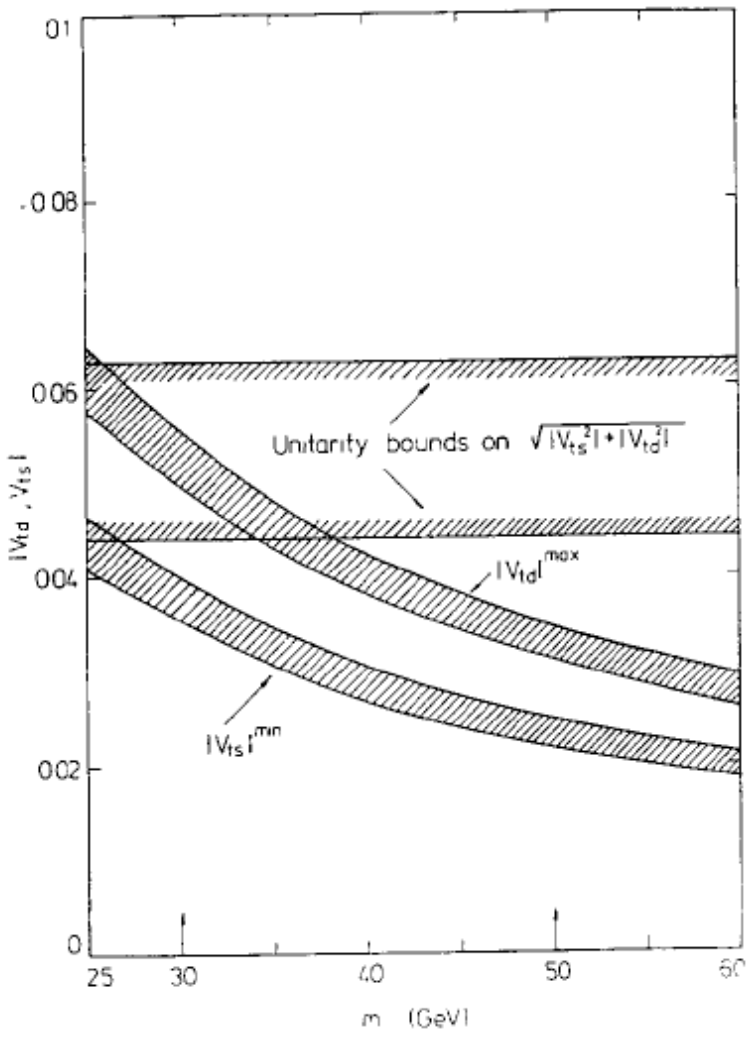
new fun stuff – b-meson mixing 1987

Observation of B0 - anti-B0 Mixing.
By ARGUS COLLABORATION (H. Albrecht *et al.*). DESY-87-029, 1987. 21pp.
Published in **Phys.Lett.B192:245,1987**. Also in Moriond 1987: Hadrons:51 (QCD161:R4:1987:V.2) (*Prentice author in Moriond*) Also in San Miniato Heavy Flavors 1987:145 (QCD161:T63:1987) (*Spengler first author in San Miniato*)

TOPCITE = 1000+
References | LaTeX(US) | LaTeX(EU) | Harvmac | BibTeX | Keywords | Cited 1174 times | More Info
Journal Server [doi:10.1016/0370-2693(87)91177-4]



early CKM-phenomenology – 1987



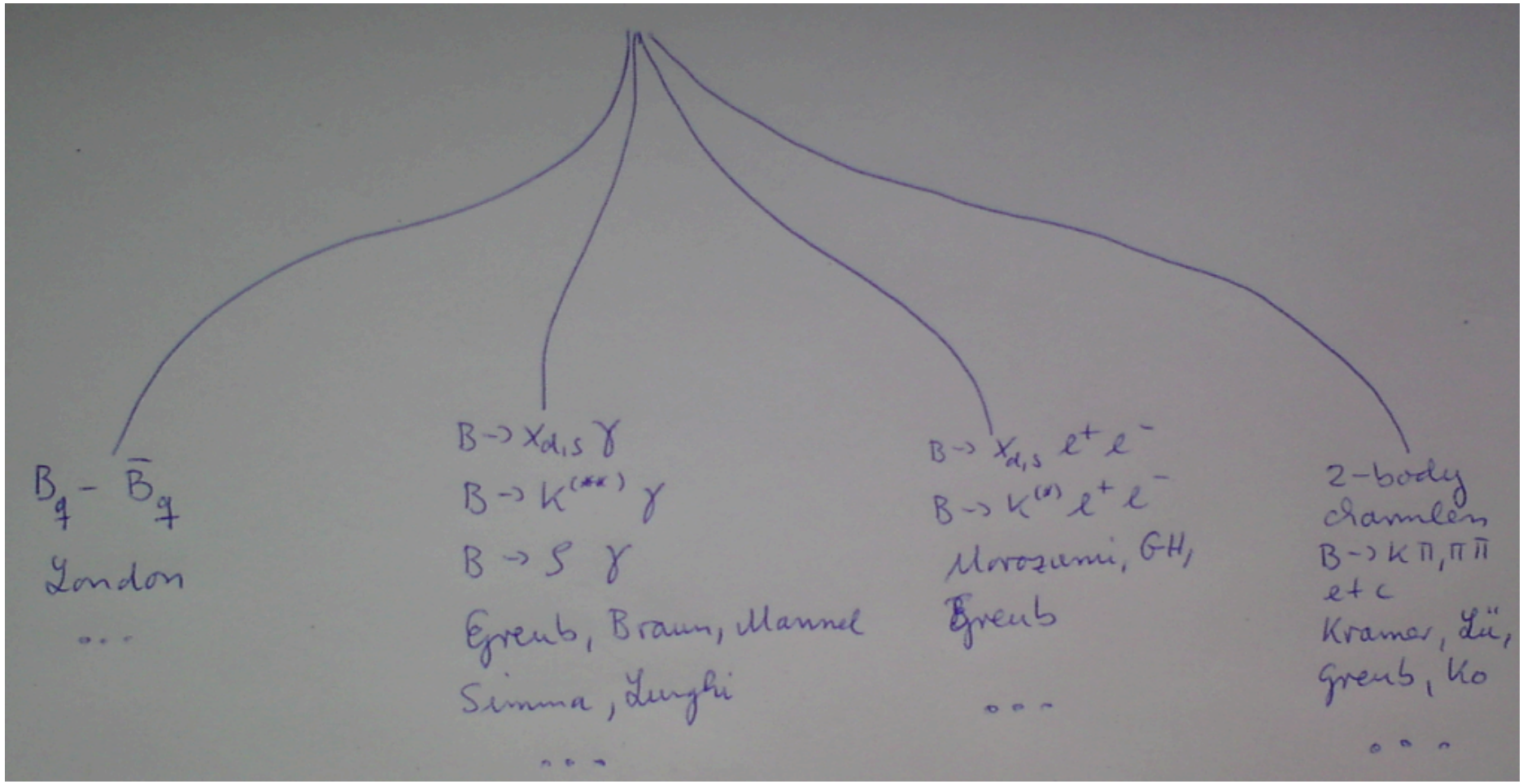
today: $|V_{td}/V_{ts}| \simeq 0.2$, $m_t \simeq 173\,\text{GeV}$

. **Bounds On The Cabibbo-kobayashi-maskawa Matrix Elements V(td) And V(ts) From Experiments On B0 Anti-b0 Mixings.**
Ahmed Ali (DESY), B. van Eijk, I. ten Have (CERN). DESY 86-108. Oct 1986. 16 pp.
Published in **Phys.Lett. B189 (1987) 354**

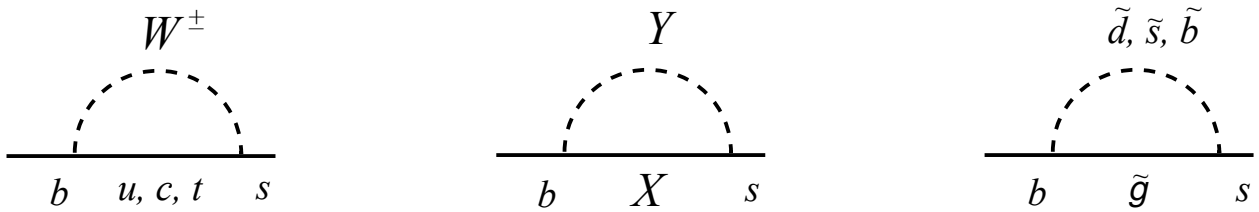
From Heavy Quarks in QCD to Rare b-Processes

HQET Wise, Georgi et al 1990

Ahmed developed several work areas: $B - \bar{B}$, $b \to q\gamma, l^+l^-$, $B \to K\pi$

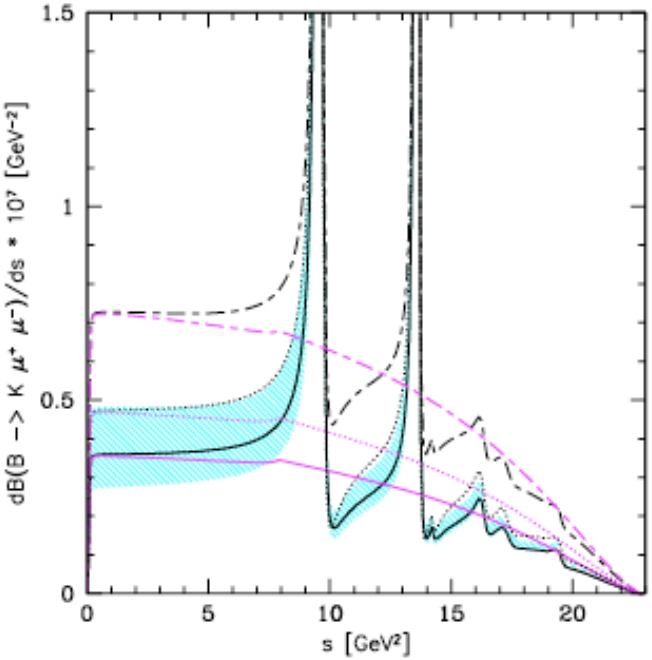


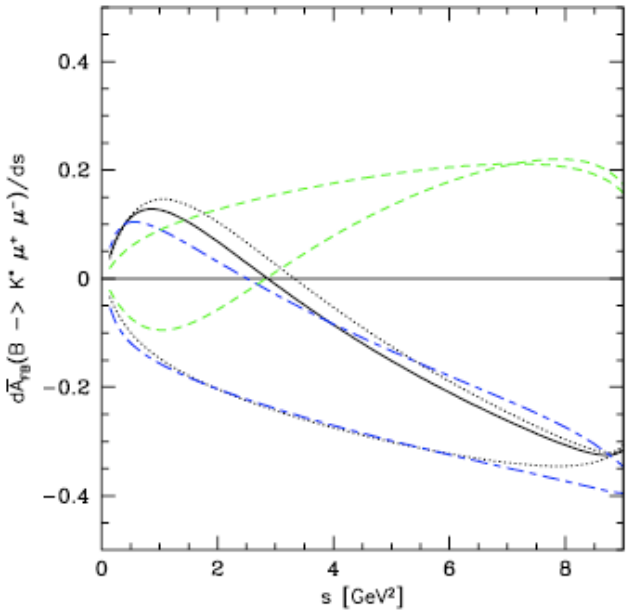
new physics – early 90ies



1. **New physics and rare B decays.**
   Ahmed Ali (DESY). 1994.
   Prepared for International Workshop on B Physics: I
   soon)

new physics – early 90ies





- **A Comparative study of the decays $B \to (K, K^{*)} \ell^+ \ell^-$ in standard model and supersymmetric theories.**
  Ahmed Ali (DESY), Patricia Ball (CERN), L.T. Handoko (DESY & Tangerang, Indonesian Inst. Phys.), G. Hiller (Frascati & SLAC). SLAC-PUB-8269, DESY-99-146, CERN-TH-99-298, LNF-99-026-P. Oct 1999. 36 pp.
  Published in **Phys.Rev. D61 (2000) 074024**
  e-Print: **hep-ph/9910221**

SUSY...

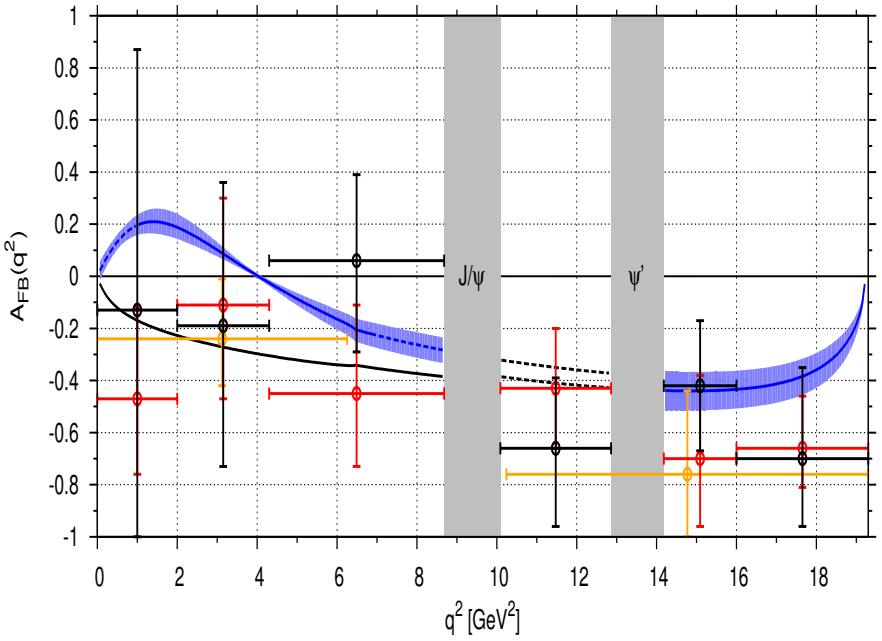
Finally ... $b \to sll$ seen

Observation of the decay $B \to K\ell^+\ell^-$.

BELLE Collaboration (K. Abe *et al.*) *Show all 213 authors*.
KEK-PREPRINT-2001-118, BELLE-PREPRINT-2001-13, DPNU-01-30.
Sep 2001
11 pp.

Phys.Rev.Lett. 88 (2002) 021801
e-Print: **hep-ex/0109026**

Abstract: We report a search for the flavor-changing neutral current decay $B \to K^{(*)}\ell^+\ell^-$ using a 29.1 fb^{-1} data sample accumulated at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB e^+e^- storage ring. We observe the decay process $B \to K\ell^+\ell^-(\ell = e, \mu)$, for the first time, with a branching fraction of $\mathcal{B}(B \to K\ell^+\ell^-) = (0.75^{+0.25}_{-0.21} \pm 0.09) \times 10^{-6}$.



black: CDF'10 4.4fb^{-1}, gold: BaBar'08, red: Belle'09; blue: SM; $q^2 = m_{ll}^2$

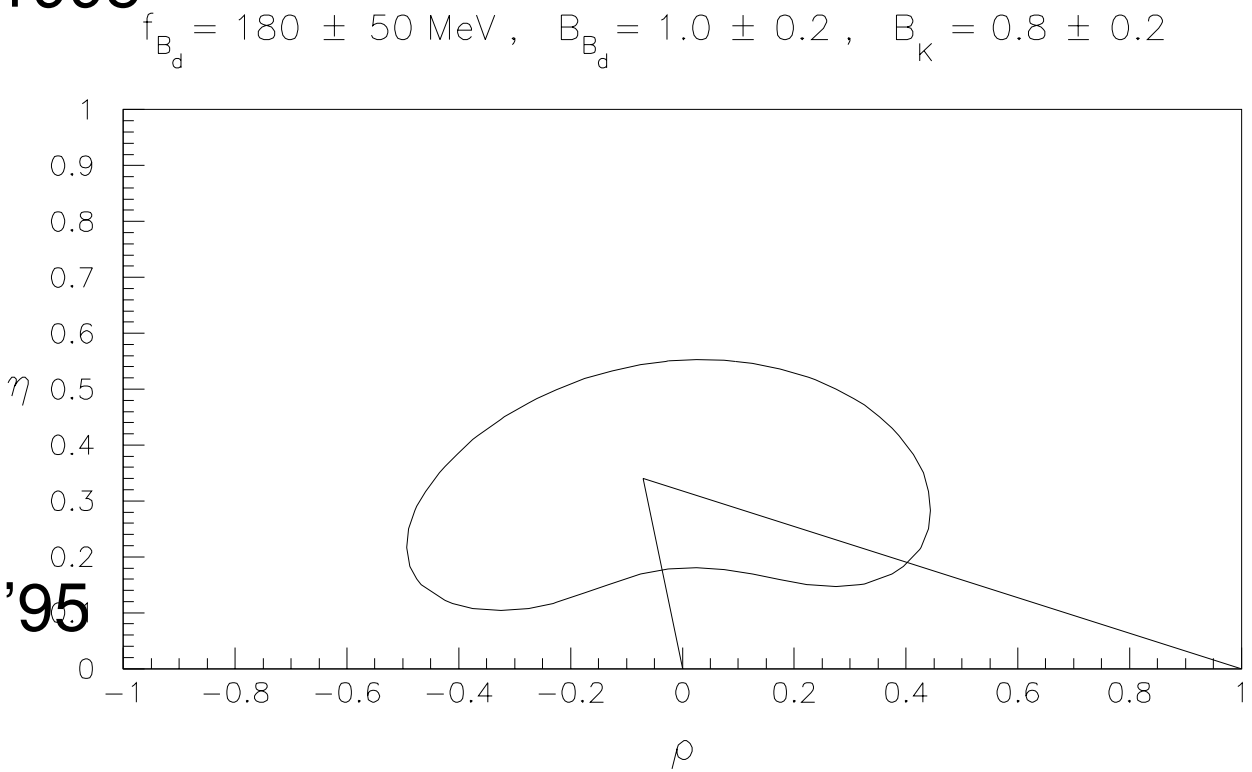
Fig. from 1006.5013 [hep-ph]

Sign of $A_{\rm FB}$ at large dilepton mass is SM-like. 0805.2525 [hep-ph]

Sign/zero of $A_{\rm FB}$ at low dilepton mass?

The "Ali-Niere (kidney)" 1995

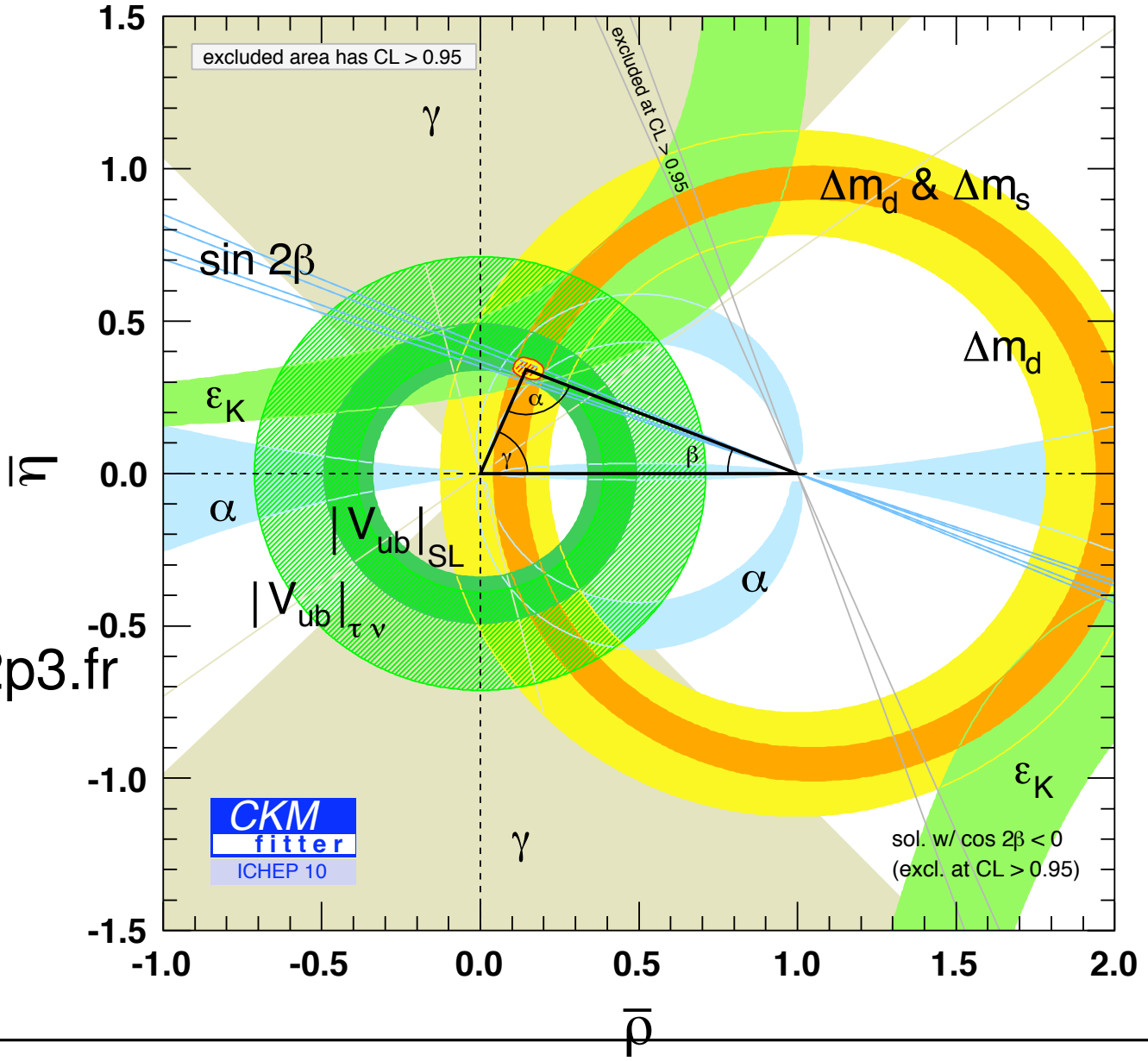
CKM-Fits 1995



ali,london '95

CKM fits today

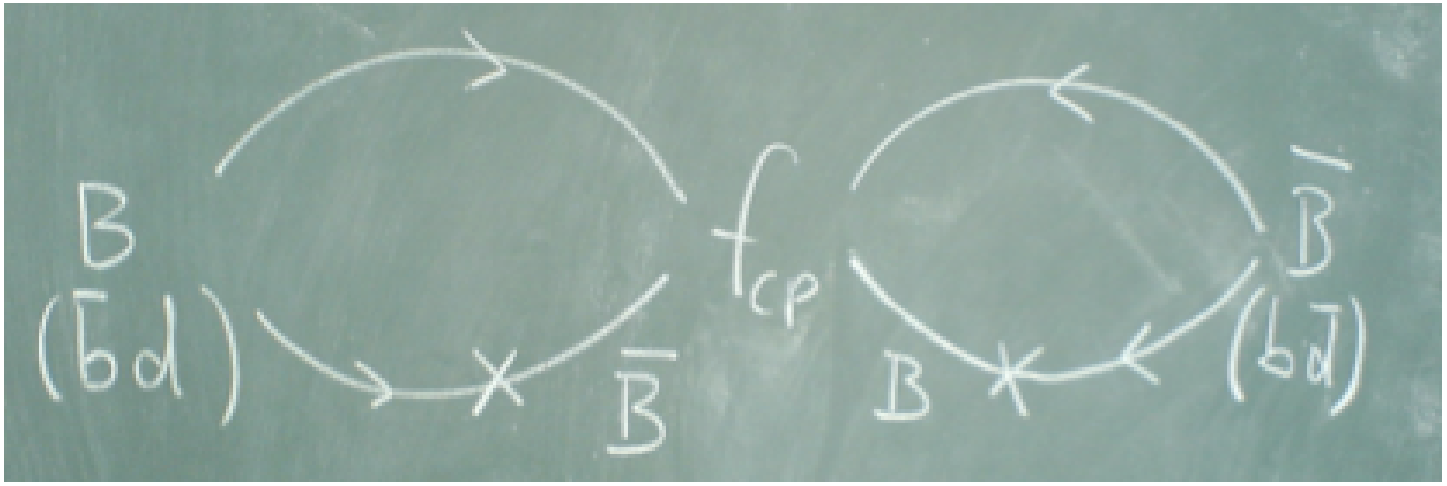
ckmfitter.in2p3.fr



CP is violated!.. together with Quark Flavor

Quark mixing matrix has a physical CP violating phase δ_{CKM}.

Verified in $B\bar{B}$ mixing $\sin 2\beta = 0.672 \pm 0.023$ HFAG Aug 2010



δ_{CKM} is large, $O(1)$!

CP violation also observed in B-decay

$A_{CP}(B \to K^{\pm}\pi^{\mp}) = -0.098 \pm 0.013$

$$\Gamma(B \to K^{+}\pi^{-}) \neq \Gamma(\bar{B} \to K^{-}\pi^{+})$$

Nobelprize in Physics 2008

The Nobel Prize in Physics 2008

"for the discovery of the mechanism of spontaneous broken symmetry in subatomic physics"

"for the discovery of the origin of the broken symmetry which predicts the existence of at least three families of quarks in nature"

Photo: Universtity of Chicago

Yoichiro Nambu

1/2 of the prize

Photo: KEK

Makoto Kobayashi

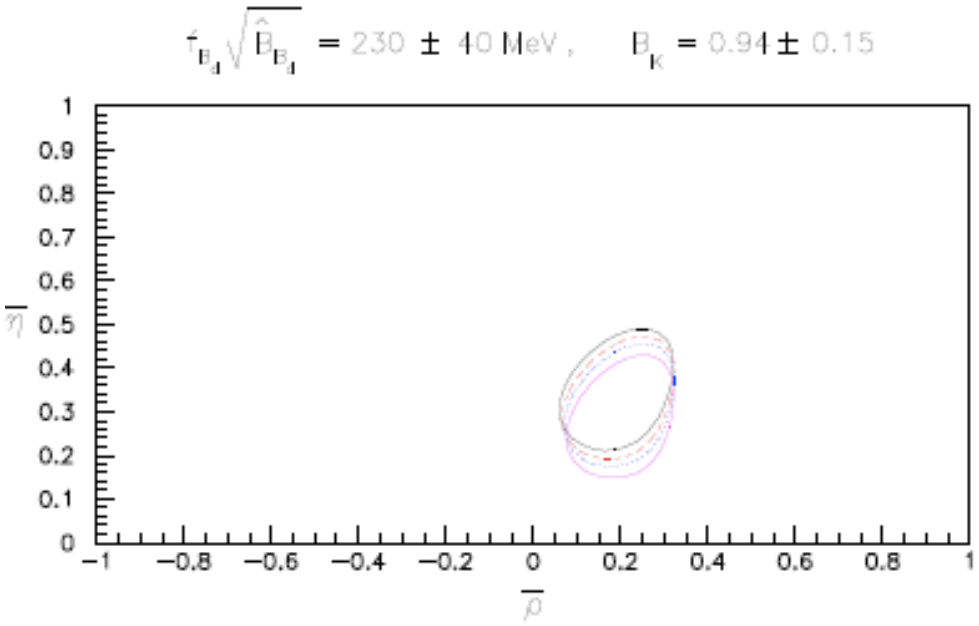
1/4 of the prize

Photo: Kyoto University

Toshihide Maskawa

1/4 of the prize

Kobayashi and Maskawa, Prog.Theor.Phys 49 (1973) 652



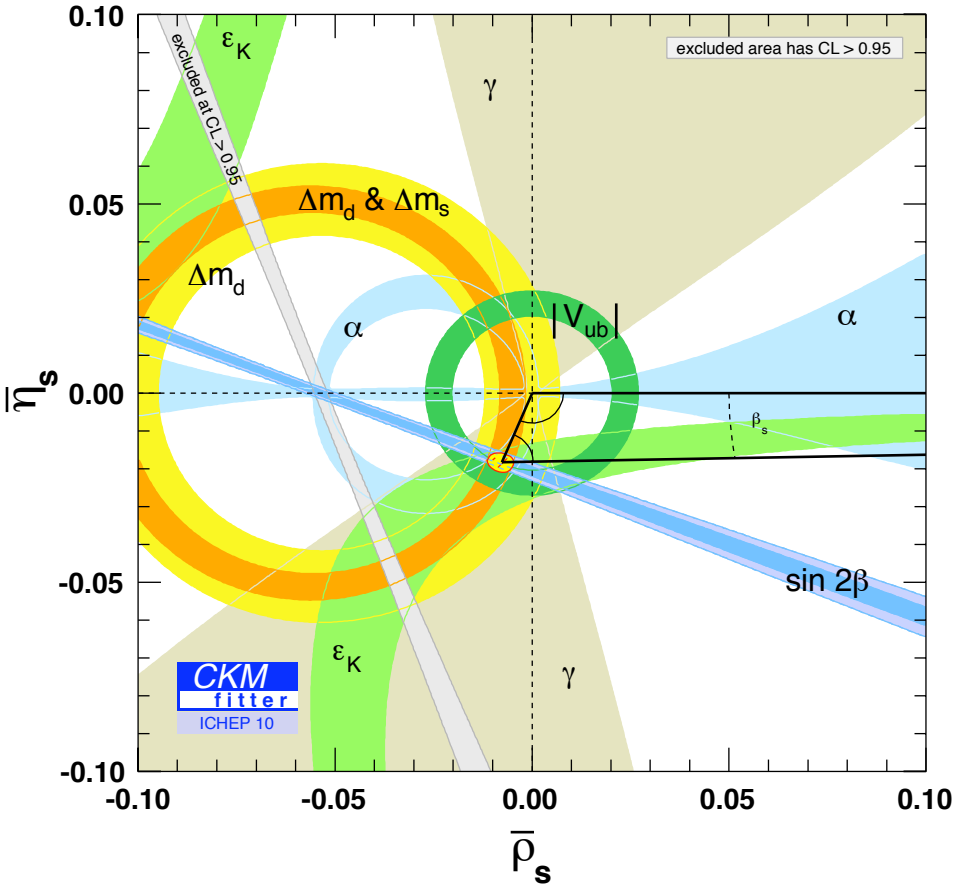
for $\Delta m_s = 17.7 \pm 1.4\,\text{ps}^{-1}$

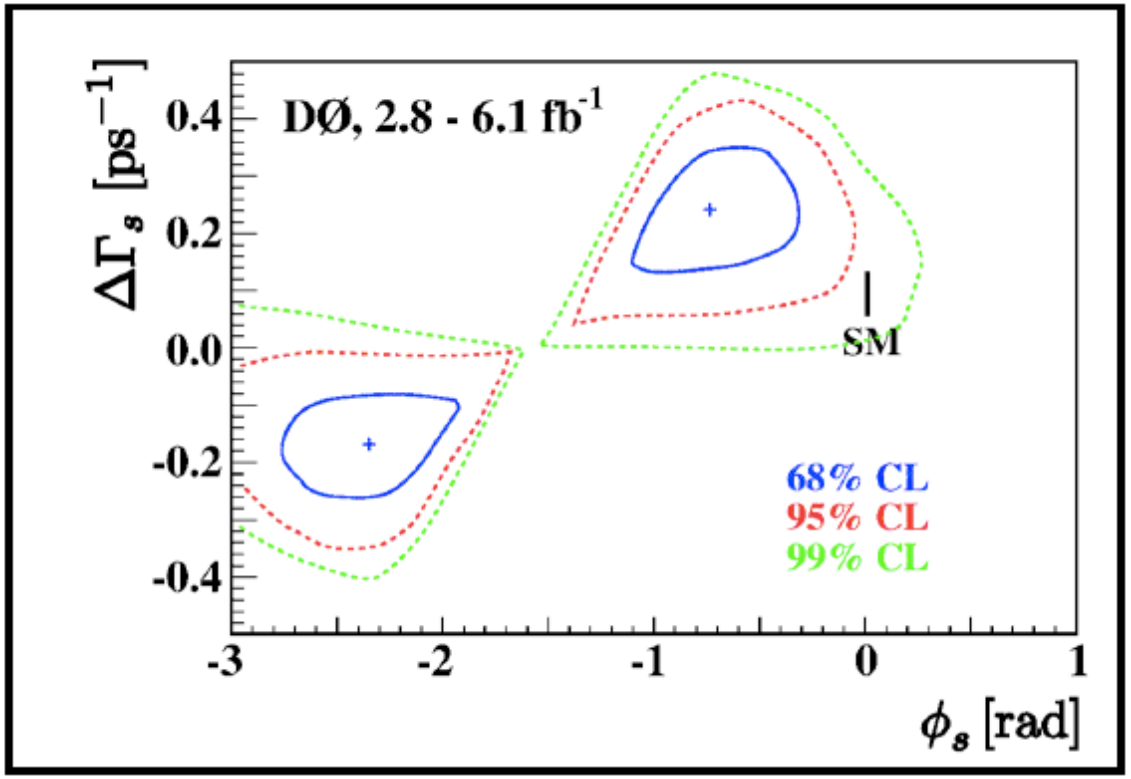
1. **What if the mass difference Δ M(s) is around 18 inverse picoseconds?.**
[49] Ahmed Ali (DESY), David London (Montreal U.). DESY-00-182, UDEM-GPP-TH-00-80. Dec 2000. 14 pp.
Published in **Eur.Phys.J. C18 (2001) 665-672**
e-Print: **hep-ph/0012155**

Discovery 2006 at the Tevatron $\sim 19\,\text{ps}^{-1}$

PDG 2010 $\Delta m_s = 17.77 \pm 0.10 \pm 0.07\,\text{ps}^{-1}$

the next triangle and B_s-CPX





ckmfitter.in2p3.fr; Right plot combined D0 from M.Williams talk at fpcp 2011.

future: LHC(b)

. **Majorana neutrinos and same sign dilepton production at LHC and in rare meson decays.**
Ahmed Ali (DESY), A.V. Borisov, N.B. Zamorin (Moscow State U.). DESY-01-051. Apr 2001. 17 pp.
Published in **Eur.Phys.J. C21 (2001) 123-132**
e-Print: **hep-ph/0104123**

DIS– pre-Hermes

Asymptotic solutions of the evolution equation for the polarized nucleon structure function g-2 (x, Q2).**
Ahmed Ali (DESY), Vladimir M. Braun (Heidelberg U. & St. Petersburg, INP), G. Hiller (Hamburg U.). DESY-91-041, HD-THEP-91-09. May 1991. 13 pp.
Published in **Phys.Lett. B266 (1991) 117-125**

many colors

Happy Birthday Ahmed

and keep going

Pictures of Ahmed and his rug are taken by Mrs Mayer from DESY-PR and an anonymous member of DESY-TH.