WG2 – B/D/K Decays

LHC Flavour Workshop
3rd Meeting, 15-17 May 2006

G. Buchalla, T. Komatsubara, F. Muheim, L. Silvestrini

Outline

- Ongoing activities
  - Web page – Study groups, list of people, guidelines summaries of previous meetings
  - Mailing list flavlhc-wg2@cern.ch
  - Weekly phone conference
- Overview of WG2 structure
  - Study groups
  - Plans (template)
- Report from May presentations
  - Joint session with WG1 - Tools (reference)
  - Special session – B_s-$B_s$bar mixing
  - Highlights
- Plans for the Yellow Book

Study Groups & Contact Persons

- Radiative Penguin Decays - [Gambino, Golutvin]
  - $b \to s\gamma$, $b \to d\gamma$ inclusive and exclusive
- Electroweak Penguin Decays - [Feldmann, Berryhill]
  - $b \to sll$ inclusive and exclusive
- Neutrino modes - [Grossmann, Iijima]
  - $b \to s\nu\nu$, $B \to \tau+\nu$, $D\tau+\nu$
- Very rare decays – [Nierste, Smizanska]
  - $B_{s,d} \to \mu+\mu-$, $\mu\mu\pi$, $\mu\mu\gamma$, $(\tau+\tau-)$
- UT angles (from tree decays) – [Soni, Bona, Trabelsi, Wilkinson]
  - β or ϕ_1: $B_d \to \psi K_S$, …
  - α or ϕ_2: $B_d \to \rho\pi$, $\pi\pi$, $\rho\rho$
    γ or ϕ_3: $B_{d,u} \to DK$ – Dalitz
  - $B_s \to D_s K$, $B_d \to \pi\pi / B_s \to KK$
- B_s-$B_s$bar mixing – [Lubicz, van Hunen]
  - Mass difference Δm_s, weak phase ϕ_s, lifetime difference $\Delta\Gamma/\Gamma$
  - $B_s \to D_s\pi$, $B_s \to J/\psi\phi$
- $b \to s$ and $b \to d$ hadronic transitions – [Ciuchini, Muheim]
  - $B_d \to \phi K_S$, $\eta' K_S$, $B_s \to \phi\phi$,… $B_d \to \pi\pi / B_s \to KK$, $B_d \to \rho\pi$, $\pi\pi$, $\rho\rho$, πK
- Kaon decays – [Buras, Komatsubara]
  - $K \to \pi\nu\nu$, $K_L \to \pi^0 ll$ and related decays
- Charm decays – [Fajfer, Asner]
  - D^0-D^0bar mixing,
  - D rare decays and CP violation
- New Physics; WG1/WG2 complementarity / Tools - [Heinemeyer; Silvestrini; Parodi]
- New Physics Benchmarks [Isidori; Okada]
- Hadronic Uncertainties [Buchalla]

WG 2

Study Group: Electroweak Penguin Decays ($b \to s\ell^+\ell^-$ inclusive and exclusive)

Contact persons: Feldmann/Berryhill.

People

name	subject	attending may meeting
Koppenburg (LHCb)	(talk at meeting I)	
Egede (LHCb)		
Gibson (LHCb)		
Smizanska (Atlas)		
Reznicek (Atlas)	(talk at meeting II)	
[Berryhill (Babar)]	report	no
Playfer (Babar)	(talk at meeting I)	
Eigen (Babar)		no
Ishikawa (Belle)		
Limosani (Belle)		
Nakao (Belle)		
[Feldmann]	(talk at meeting II)	yes
Safir		yes
Zhu	$B \to K^*\ell^+\ell^-$ and SCET	yes
Greub		
Hiller		
P. Colangelo	(talk at meeting I)	no
Mannel		no
Khodjamirian		no
Ball		
Zwicky	(talk at meeting II)	no
Ligeti	(talk at meeting I)	no
De Fazio		no
Ferrandes		no

Suggestions

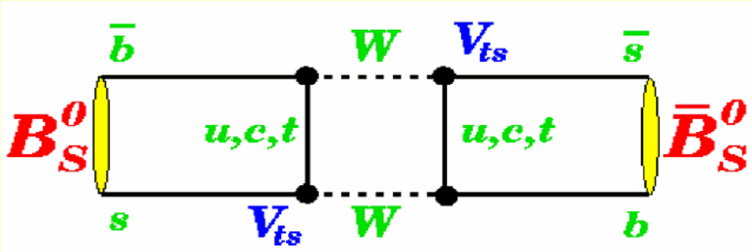
- $B \to X_s\ell^+\ell^-$ and m_X cut phase space at LHC and Super-B (Egede/Golutvin/Ligeti)
- Perturbative and non-perturbative uncertainties in $B \to K^*\ell^+\ell^-$ (Zhu, see also recent paper by Ali et al. hep-ph/0601034)
- Electromagnetic logarithms in $B \to X_s\ell^+\ell^-$ (one of the authors of hep-ph/0512066)
- Exclusive $B \to K^*$ transitions in scenario with universal extra dimension (one of the authors of hep-ph/0604029)
- what are the unique new physics sensitivities of sll esp. in the light of the recent B_s mixing result?

Presentations at this meeting

• Radiative Penguin Decays	Haisch, Belyaev
• Electroweak Penguin Decays	Huber, Berryhill
• Neutrino modes –	Iijima, Okada, Robertson
• Very rare decays	Kao, Lin, Dedes
• UT angles (from tree decays)	Vysotsky, Deschamps Bona, Rademacker
• B_s-$B_s$bar mixing	Borrisov, De Cecco, Lenz, Guadagnoli, Bona, T'Jampens, Ball
• $b \to s$ and $b \to d$ hadronic transitions	Beneke, Conte
• Kaon decays	Smith
• Charm decays	Sultansoy, Asner
• New Physics; WG1/WG2 complementarity / Tools	Skands
• New Physics Benchmarks	Isidori, Buras/Tarantino
• Hadronic Uncertainties	
• Super B-factories	Nakada, Yamauchi, Giorgi, Oide, Raimondi

B_s Mixing

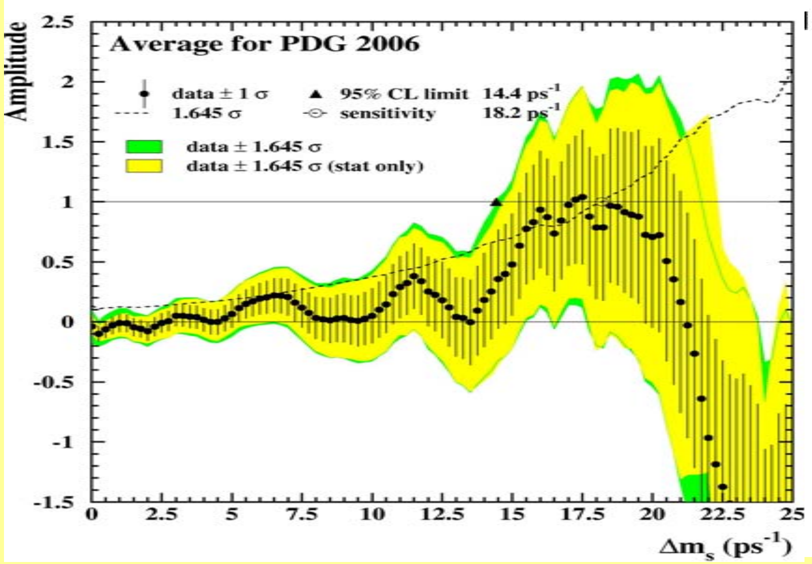
de Cecco

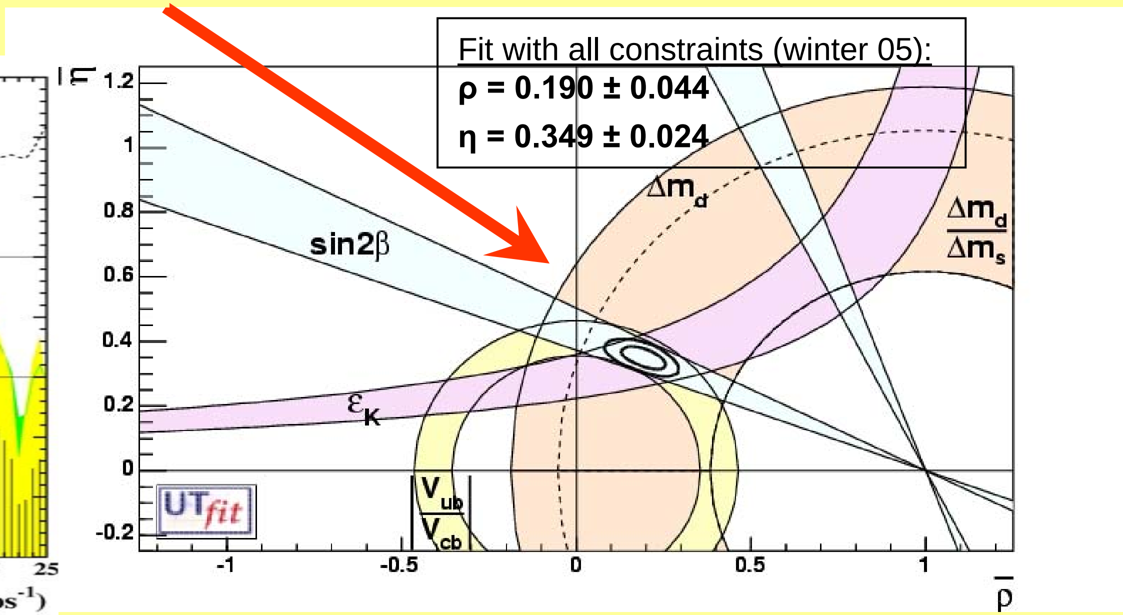


but: $|V_{ts}|>>|V_{td}| \rightarrow \Delta m_s>>\Delta m_d$

$$\frac{\Delta m_s}{\Delta m_d} = \frac{m_{Bs}}{m_{Bd}} \frac{f_{Bs}^2 B_{Bs}}{f_{Bd}^2 B_{Bd}} \frac{|V_{ts}|^2}{|V_{td}|^2} = \frac{m_{Bs}}{m_{Bd}} \xi^2 \frac{|V_{ts}|^2}{|V_{td}|^2}$$

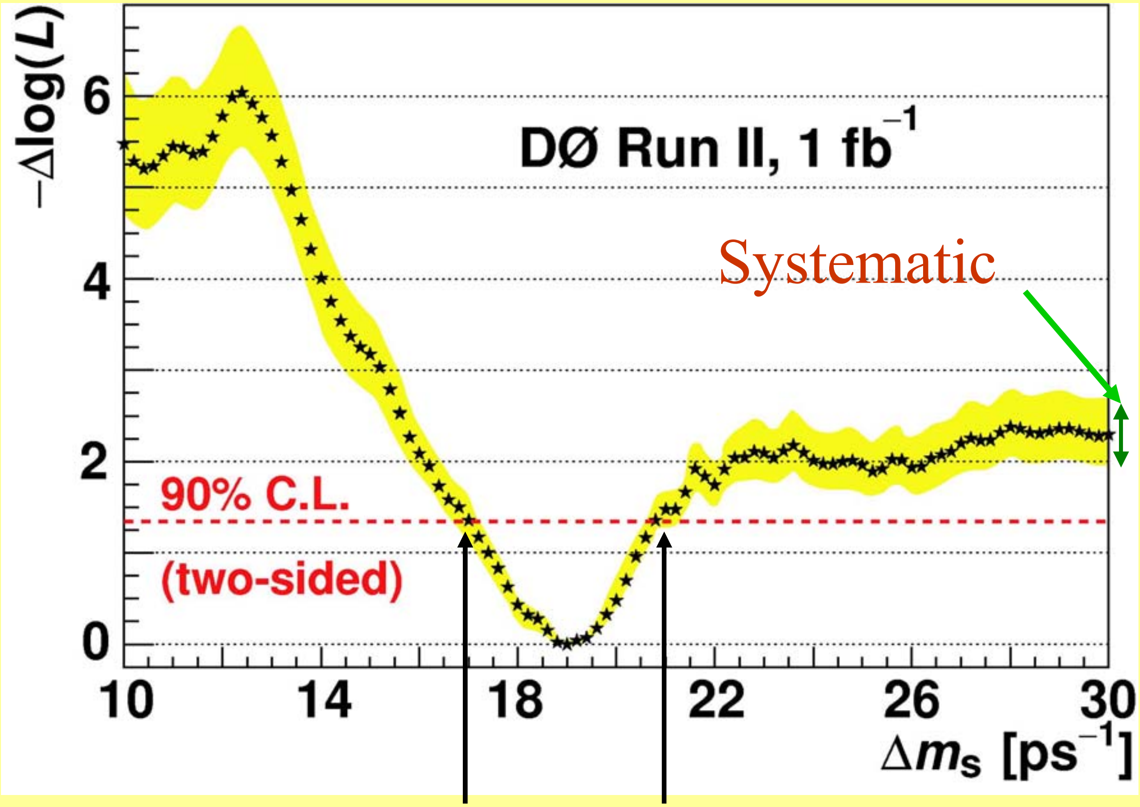
Measuring $\Delta m_s/\Delta m_d$ determines $|V_{ts}|/|V_{td}|$
Lattice calculation error O(5%)



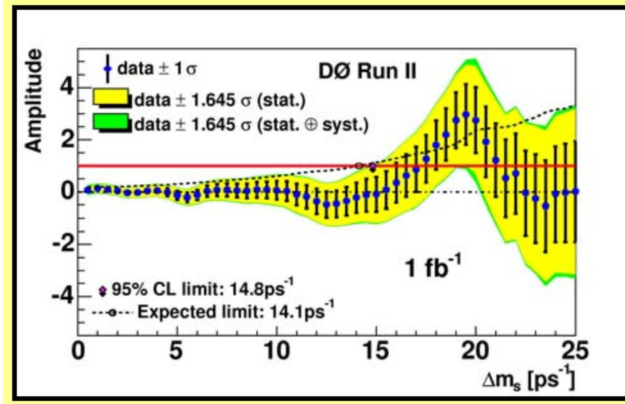


B_s Mixing in D0

Log Likelihood Scan



Amplitude Scan

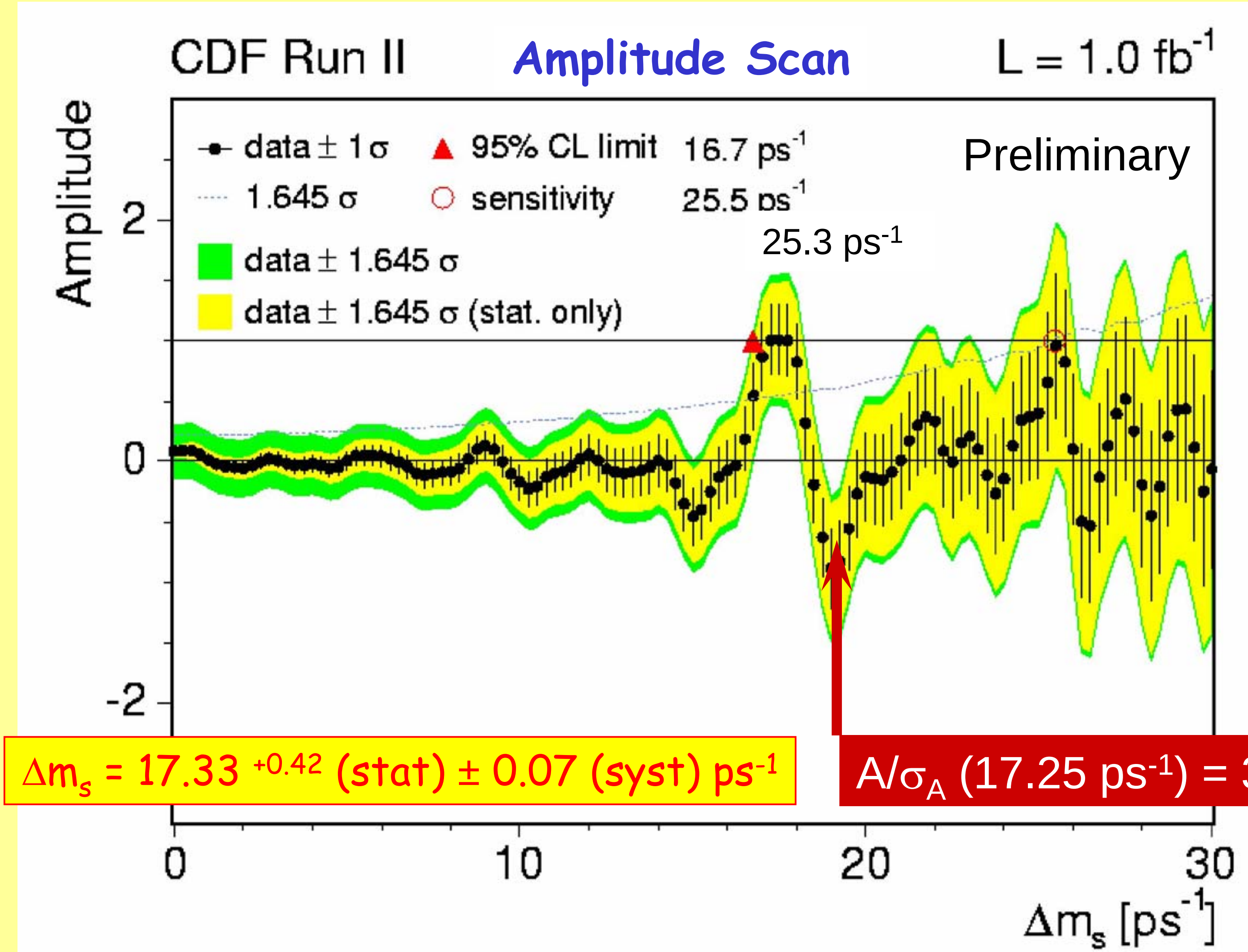


$17 < \Delta m_s < 21$ ps^{-1} 90% CL assuming Gaussian errors;

Most probable value Δm_s =19 ps^{-1};

Measurement of B_s Oscillations at CDF

de Cecco



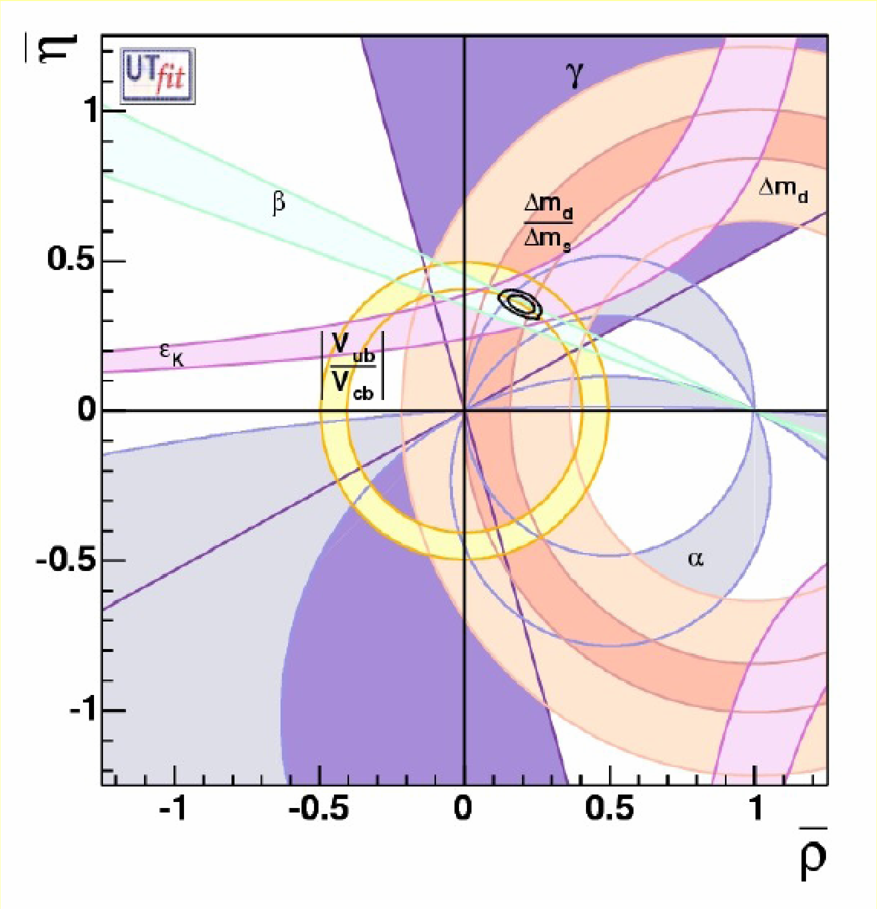
Δm_s = 17.33 $^{+0.42}$ (stat) ± 0.07 (syst) ps^{-1}

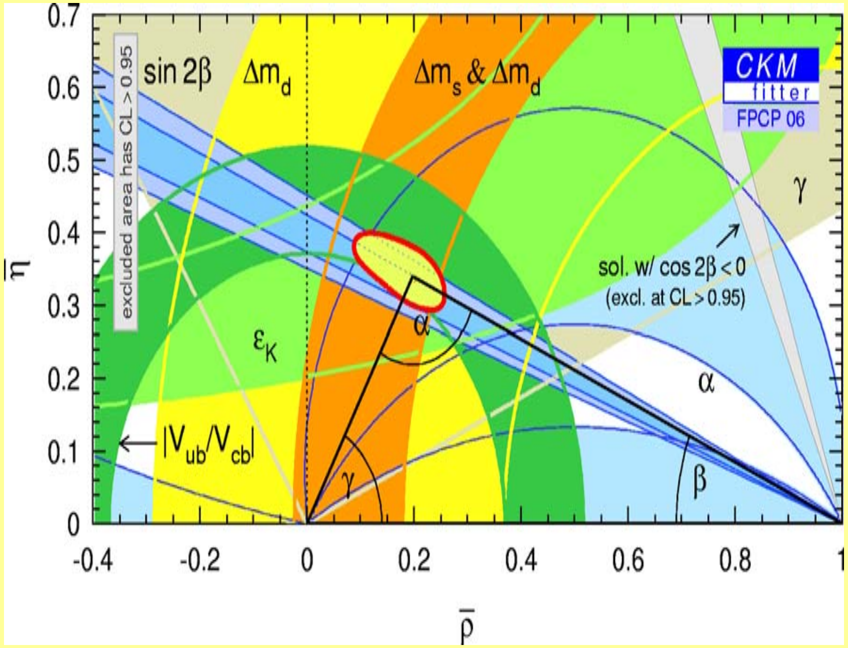
A/σ_A (17.25 ps^{-1}) = 3.5

- probability of fake from random tags = 0.5% → measure $\Delta \mathbf{m_s}$

Bona
T'Jampens

Rho-eta fits





- Tension between Sin2β and V_{ub} inclusive

SUSY contributions to ΔM_s

$$\Delta M_s^{MSSM} = \Delta M_s^{SM} + \Delta M_s^{\tilde{g}} + \Delta M_s^{H-\text{box}} + \Delta M_s^{H-\text{DP}} + \Delta M_s^{\tilde{\chi}^+} +$$

neutralinos: negligible

gluinos

Dominant contribs, when NOT assuming any symmetry in the squark matrix

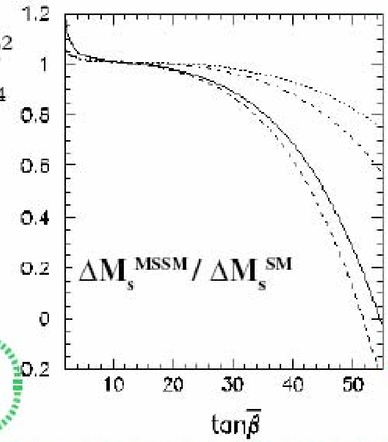
For low/moderate $\tan\beta$, SUSY contrib's = gluinos

Higgses

$$\Delta M_s^{H-\text{box}} \propto -\tan\beta^2$$
$$\Delta M_s^{H-\text{DP}} \propto -\tan\beta^4$$

Dominant contribs (*negative*), for large $\tan\beta$

Buras et al. ***NPB 619 (2001)***



charginos

One has in general

$$\frac{\Delta M_s^{\tilde{\chi}^+}}{\Delta M_s^{\tilde{g}}} \le 10^{-2} \frac{\delta_u \times \delta_u}{\delta_d \times \delta_d}$$

Ball et al. ***PRD 69 (2004)***

Naïve ranking of gluino contributions

Assuming $M_{gluino} / M_{squark} \approx 1$, one finds

$$\frac{\Delta M_s^{\tilde{g}}}{\Delta M_s^{SM}} \simeq \left(\frac{500\,\text{GeV}}{m_{\tilde{q}}}\right)^2 \Big[O(1)\left(\delta_{LL}^2 + \delta_{RR}^2\right) + O(10)\left[\left(\delta_{LR}^2 + \delta_{RL}^2\right) \;\&\; \left(\delta_{LR}\delta_{RL}\right)\right] + O(100)\left(\delta_{LL}\delta_{RR}\right)$$

Looking at **single** δ's, bounds are hierarchical

- δ_{LL} (or δ_{RR}) only ☞ $|\delta| \le 0.4$
- $(\delta_{LR}, \delta_{RL})$ ☞ $b \to s\gamma$ does better
- $\delta_{LL} \times \delta_{RR}$ only ☞ $|\delta| \le 0.02 \div 0.05$

Predictions for ΔM_s^{SM}

$$M_{12}^q = M_{12}^{q,SM}(1 + \kappa_q e^{i\sigma_q})$$

Ball

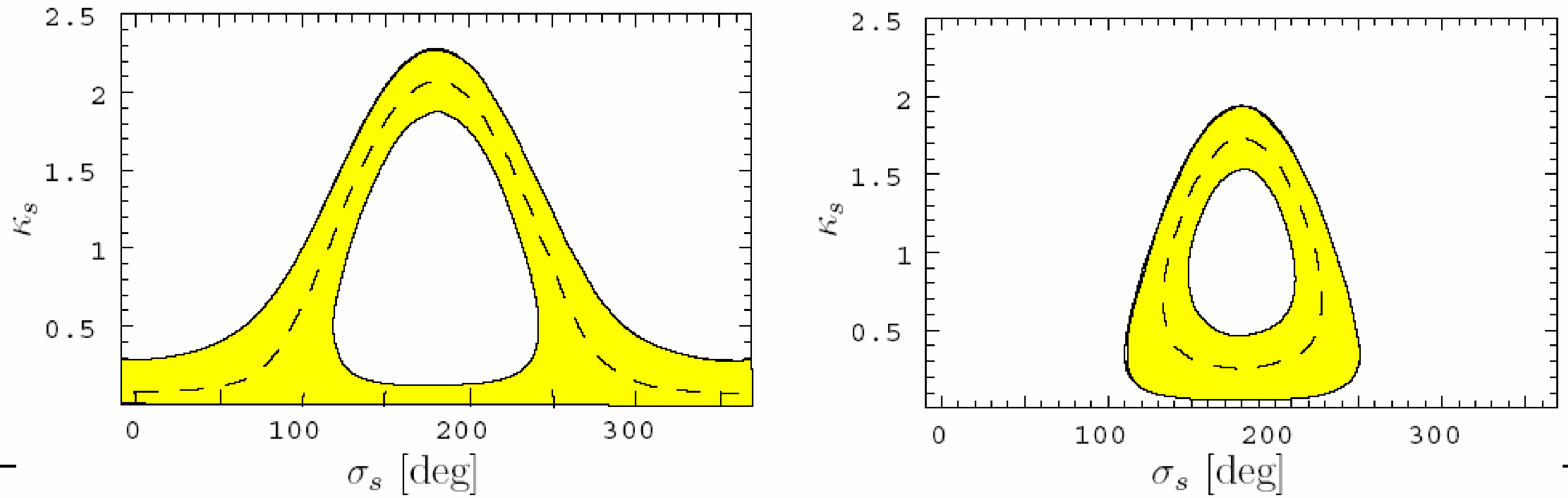
$$\Delta M_s^{SM}\big|_{JLQCD} = (16.1 \pm 2.8)\,\text{ps}^{-1}$$

$$\rho_s\big|_{JLQCD} = 1.08^{+0.03}_{-0.01}(\text{exp}) \pm 0.19(\text{th})$$

$$\Delta M_s^{SM}\big|_{(HP+JL)QCD} = (23.4 \pm 3.8)\,\text{ps}^{-1}$$

$$\rho_s\big|_{(HP+JL)QCD} = 0.74^{+0.02}_{-0.01}(\text{exp}) \pm 0.18(\text{th}) \quad 1.5\sigma!$$

JLQCD: (HP+JL)QCD:



B_s Lifetime Difference

with the Bag parameters from Becirevic et al. we get

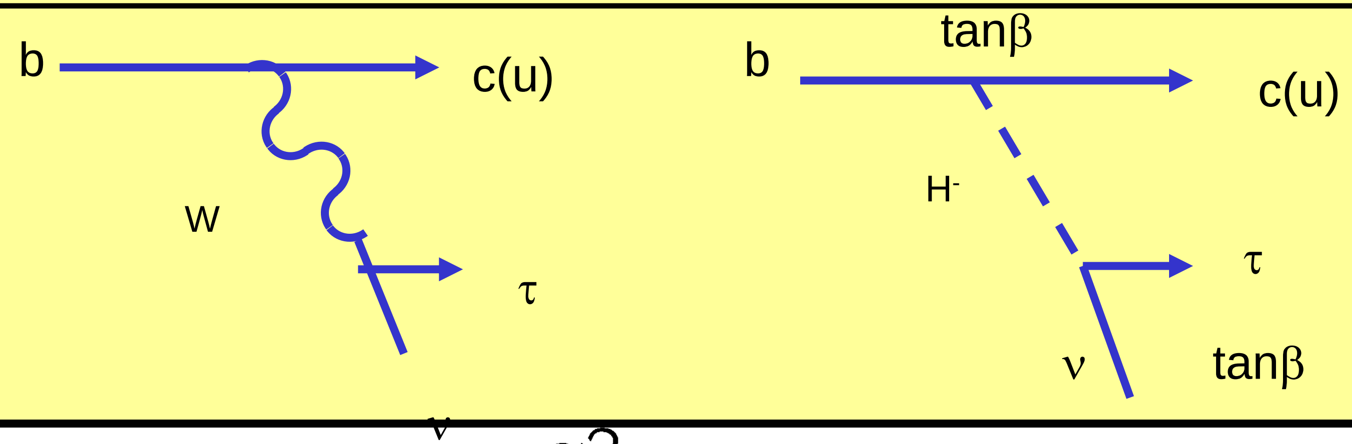
$$\left(\frac{\Delta\Gamma}{\Gamma}\right)_{B_s} = 13\pm5\%, \qquad \Delta\Gamma_s = 0.086 \pm 0.031\text{ps}^{-1}$$

$$\left(\frac{\Delta\Gamma}{\Delta M}\right)_{B_s} = 0.0039 \to \Delta\Gamma_s = \frac{0.07}{\text{ps}} \equiv f_{B_s} \approx 221\text{MeV}$$

- Change of basis is theoretically advantageous
  - Coefficient of B becomes dominant
  - $1/m$-corrections become smaller
  - α_s-corrections become smaller
- Theoretical clean prediction of $\Delta\Gamma/\Delta M$
- Γ_5 in progress $\to$ test HQE

Okada

B-> τν branching ratio in the type II 2HDM



$$B(B \to \tau\nu) = \tau_B \frac{G_F^2}{8\pi}|V_{ub}|^2 f_B^2 M_B^2 M_\tau^2 (1 - \frac{M_\tau^2}{M_B^2}) \times (1 - \frac{M_B^2 \tan^2\beta}{M_H^2})^2$$

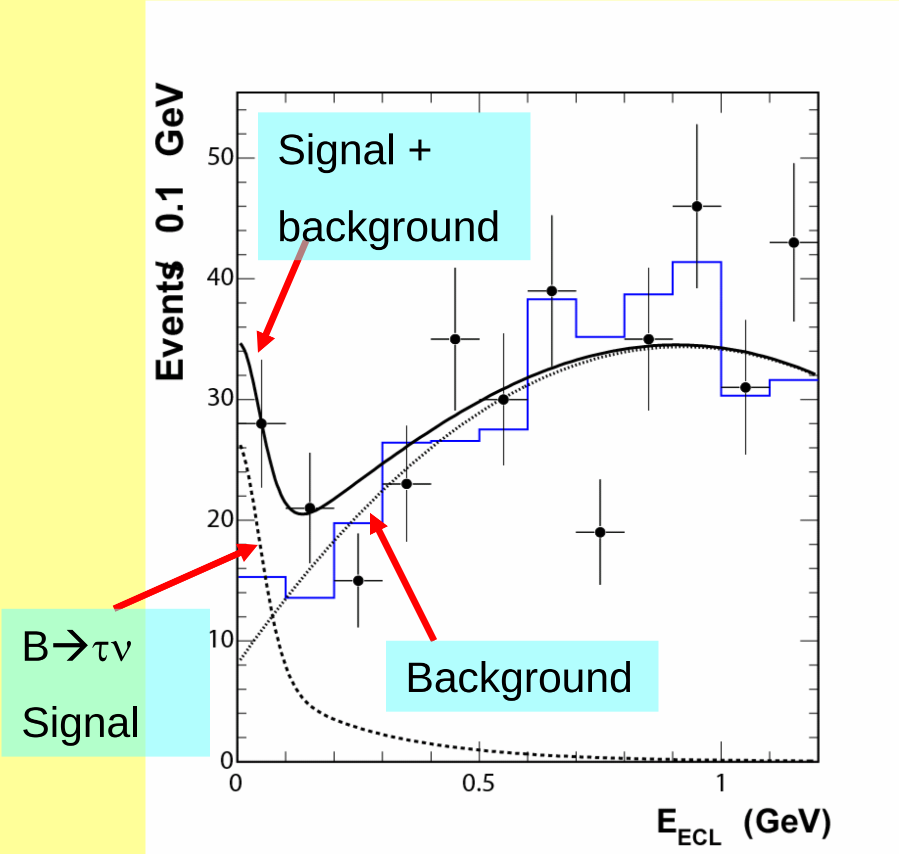
Theoretical uncertainty $f_B^2|V_{ub}|^2$

Charged Higgs effects $(1 - \frac{M_B^2 \tan^2\beta}{M_H^2})^2$

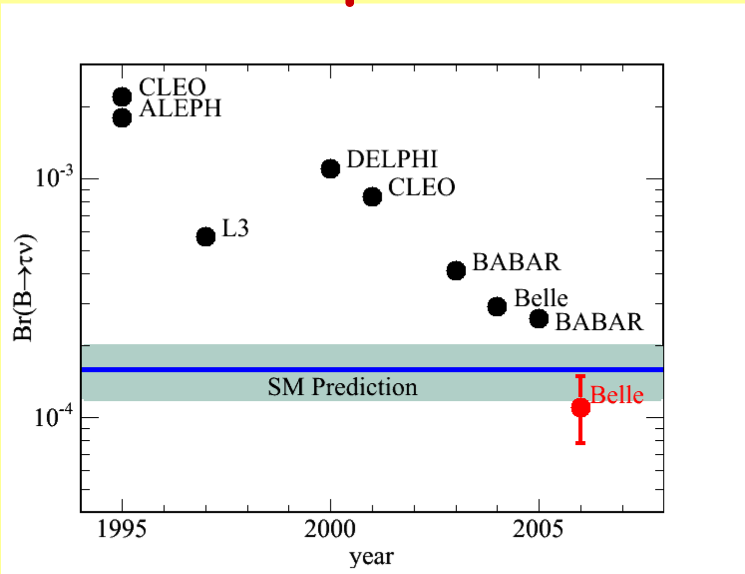
Search for B→τν

Iijima

- The final results are deduced by unbinned likelihood fit to the obtained E_{ECL} distributions.



First Evidence ! April 2006



Signal shape : Gauss + exponential
Background shape : second-order polynomial

Observe $21.2^{+6.7}_{-5.7}$ events with a significance of 4.2σ

Constraints on Charged Higgs

Iijima

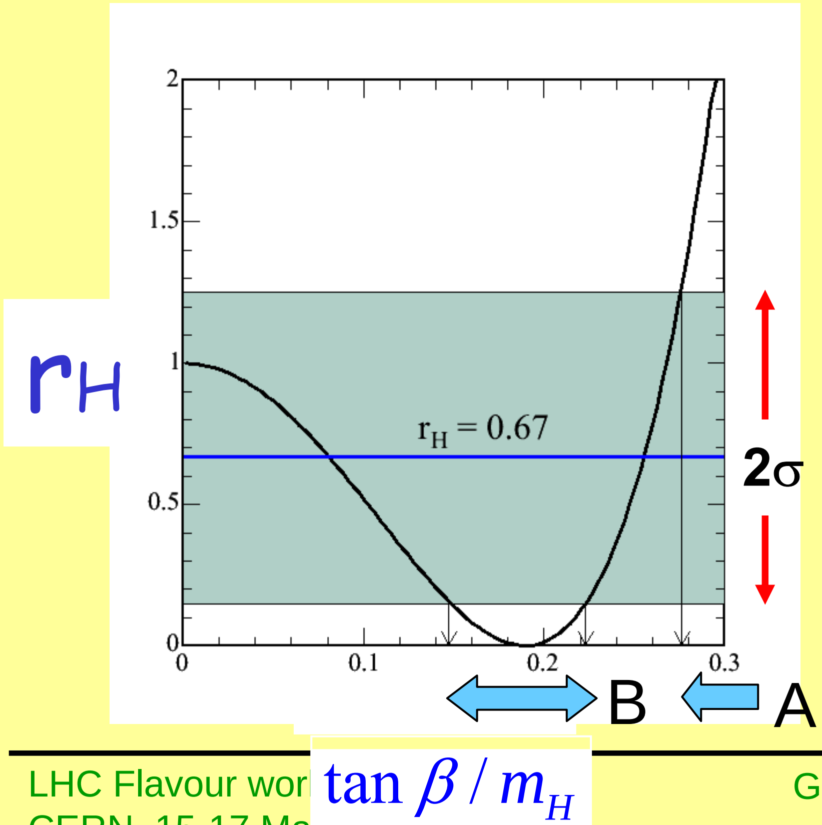
$$\mathcal{B}(B \to \tau\nu) = \mathcal{B}(B \to \tau\nu)_{\rm SM} \times r_H$$

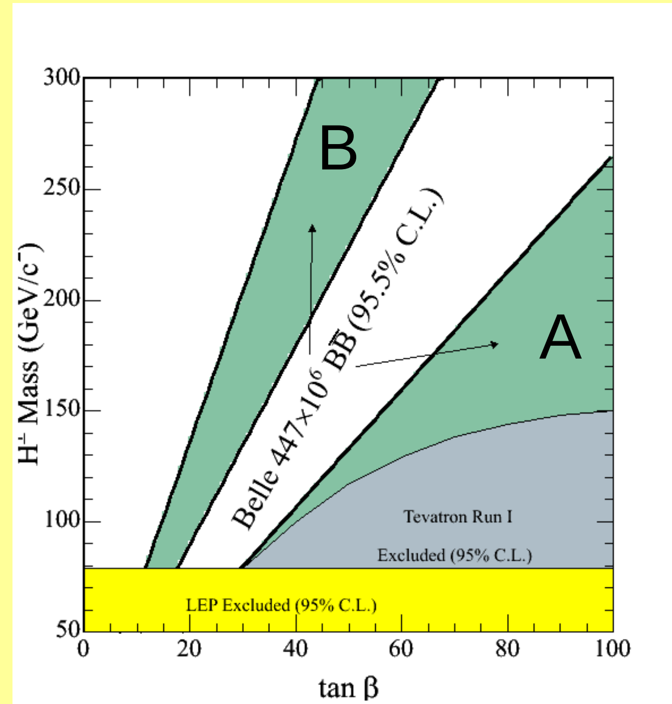
$$r_H = \left(1 - \frac{m_B^2}{m_H^2}\tan^2\beta\right)^2$$

$$\mathcal{B}(B \to \tau\nu) = (1.06^{+0.34}_{-0.28}({\rm stat})^{+0.18}_{-0.16}({\rm syst})) \times 10^{-4}$$

$$B(B \to \tau\nu)_{SM} = (1.59 \pm 0.40) \times 10^{-4}$$

$$r_H = 0.67^{+0.29}_{-0.26}$$



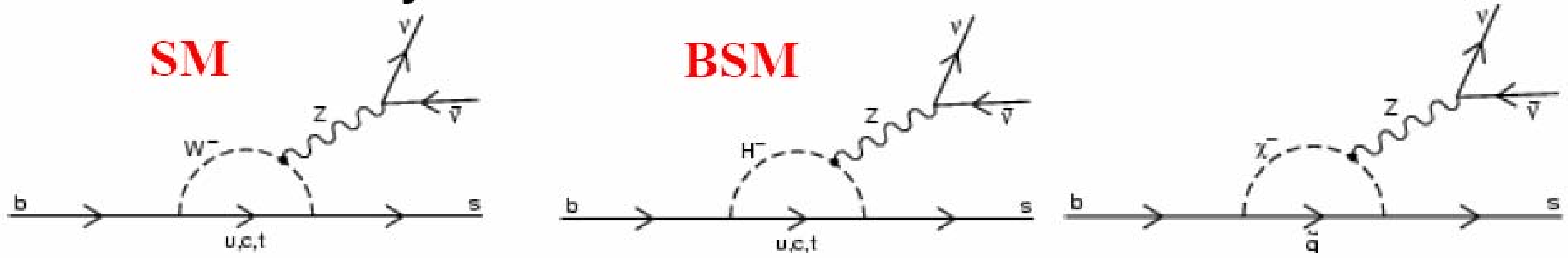


95.5%C.L. exclusion boundaries

Robertson

b→sνν

- **Inclusive b → sνν claimed by theorists to be the "theoretically cleanest" rare B decay, with potentially interesting sensitivity to various New Physics scenarios**



  - unfortunately, it appears to be intractable even in clean B factory environment, hence exclusive $B^+ \to K^+ \nu \nu$ has been main target of experimentalists to date*

- **SM rate of 3.8×10^{-6} hence experiment is within an order of magnitude** (note that neither BABAR nor Belle results use full current dataset)

	BABAR	Belle	CLEO
$BR(B^+ \to K^+ \nu \nu)$	$< 5.2 \times 10^{-5}$	$< 3.6 \times 10^{-5}$	$< 2.4 \times 10^{-4}$

* there is an earlier paper from LEP, but limit is let stringent than current exclusive limits

Decay Width

$B \to X_s l^+ l^-$

Huber

- Differential decay width: $(\hat{s} \equiv q^2/m_b^2)$

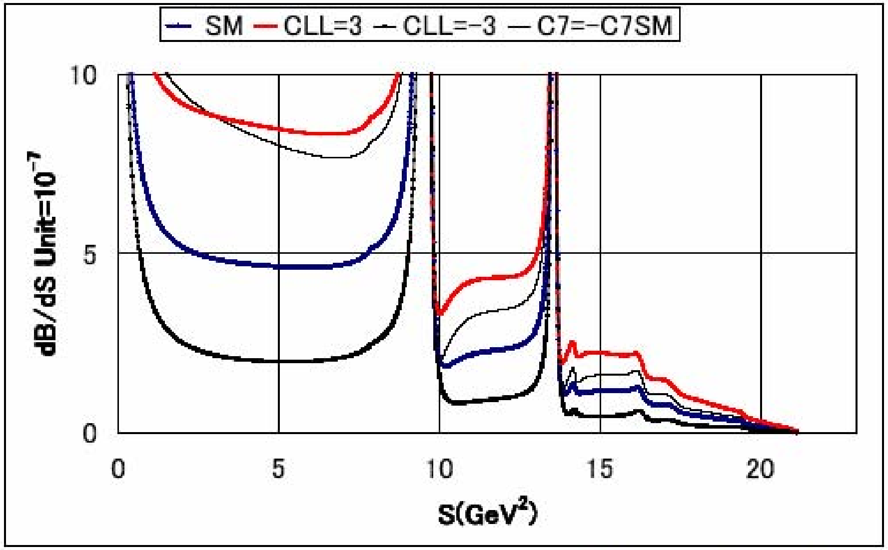
$$\frac{d\Gamma(\bar{B} \to X_s\, l^+ l^-)}{d\hat{s}} = \frac{G_F^2 m_b^5 |V_{ts}^* V_{tb}|^2 \alpha_{em}^2(\mu)(1-\hat{s})^2}{768\pi^5}$$

$$\times\left\{(4+\tfrac{8}{\hat{s}})\left|\tilde{C}_7^{eff}\right|^2 + (1+2\hat{s})\left(\left|\tilde{C}_9^{eff}\right|^2+\left|\tilde{C}_{10}^{eff}\right|^2\right) + 12\,\mathrm{Re}\left(\tilde{C}_7^{eff}\tilde{C}_9^{*\,eff}\right) + \frac{d\Gamma^{brems}}{d\hat{s}}\right\}$$

- Compare to:

$$\Gamma(\bar{B} \to X_s\gamma) \propto \left|\tilde{C}_7^{eff}\right|^2$$

- SM size and signs of amplitudes
  - $\tilde{C}_7^{eff} \simeq -0.30$
  - $\tilde{C}_9^{eff} \simeq +4.05$
  - $\tilde{C}_{10}^{eff} \simeq -4.26$



[Akeroyd et. al.]

$B \to K^* ll$ Angular Distribution

Berryhill

Low q^2 lower limit excludes SM at 98% CL (2.05σ)

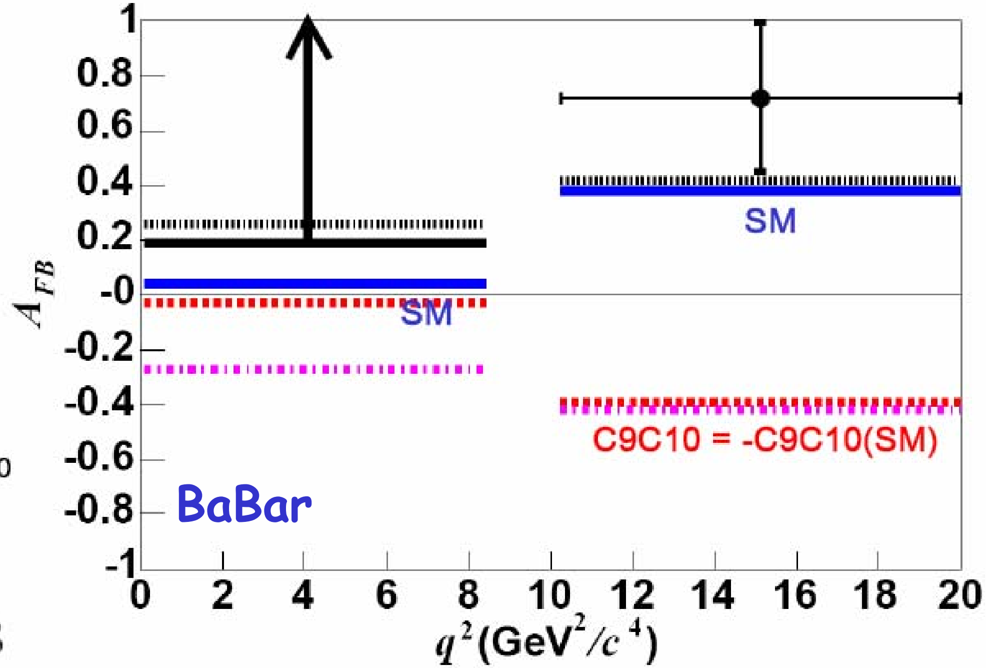
$$A_{FB} > 0.19 \ (95\%\text{CL})$$

$$A_{FB}(SM) = 0.03$$

At high q^2, wrong-sign C_9C_{10} is excluded at >3σ

$$A_{FB} = 0.72^{+0.28}_{-0.26} \pm 0.08$$

$$A_{FB}(SM) = 0.38$$



SM and alternate predictions from
NNLO OPE + LCSR form factors,
Ali et al. Phys. Rev. D 66 034002 (2002)
Ball and Zwicky Phys. Rev. D 71 014029 (2005)

LHC Flavor 15 May 06 13

Lin

$B_s \rightarrow \mu^+\mu^-$ Branching Ratio Limits

- Using Bayesian methods (flat prior) and including stat+syst errors
- Time evolution of limits (in 95%CL):

CDF B_s->$\mu\mu$	176 pb^{-1}	7.5×10^{-7}	Published
DØ B_s->$\mu\mu$	240 pb^{-1}	5.1×10^{-7}	Published
DØ B_s->$\mu\mu$	300 pb^{-1}	4.0×10^{-7}	Prelim.
DØ <B_s->$\mu\mu$>	700 pb^{-1}	<2.3×10^{-7}>	Prelim. Sensitivity
CDF B_s->$\mu\mu$	364 pb^{-1}	2.0×10^{-7}	Published
CDF B_s->$\mu\mu$	780 pb^{-1}	1.0×10^{-7}	Prelim.
CDF B_d->$\mu\mu$	364 pb^{-1}	4.9×10^{-8}	Published
CDF B_d->$\mu\mu$	780 pb^{-1}	3.0×10^{-8}	Prelim.

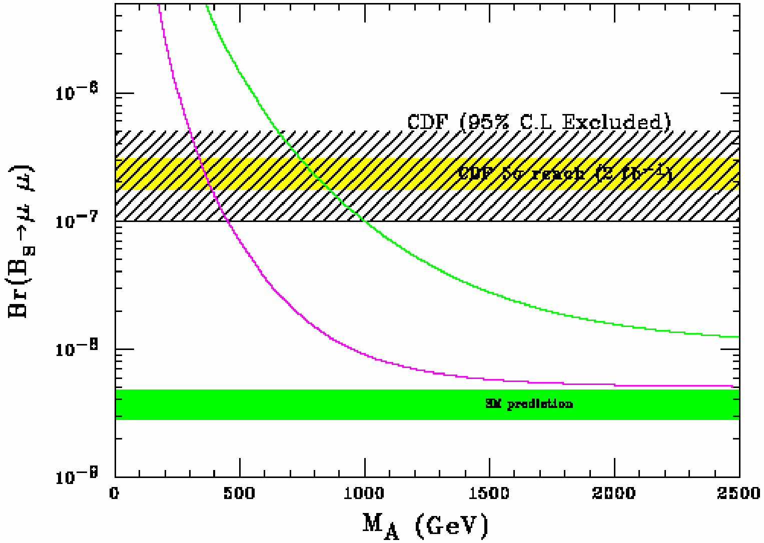
World's best limits

Combine CDF + D0 (expected limit) improves result by ~20%

→ $Br(B_s \rightarrow \mu\mu) < \sim 0.8\times10^{-7}$ @ 95%C.L.

$B_s \rightarrow \mu^+\mu^-$

- $\mathcal{B}(B_s \to \mu^+\mu^-)$ is large in SUSY because of the $\tan\beta$-enhanced Higgs penguin
- Two approaches exist : Diagrammatic and Effective Lagrangian[a]
- GIM operative points exist
- Indirect probe of the heavy Higgs sector



Dedes, Huffman, 2004

NNLO Matrix Elements

- large β_0 limit of 2- and 3-loop $\mathcal{O}(\alpha_s^2)$ matrix elements of $Q_{7,8}$ and $Q_{1,2}$ worked out

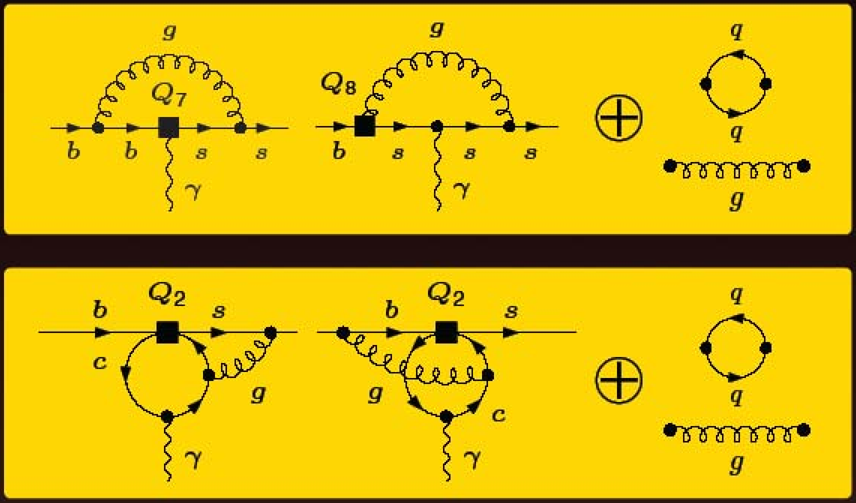
  Bieri et al. '03

- analytic results for 2-loop $\mathcal{O}(\alpha_s^2)$ corrections to self-interference of Q_7 derived

  Blokland et al. '05, Asatrian et al. '06; Melnikov & Mitov '05, Asatrian et al., Ferroglia & Gambino

- interpolation in m_c of 3-loop $\mathcal{O}(\alpha_s^2)$ matrix elements of $Q_{1,2}$ very far advanced

  Misiak & Steinhauser



$B \to X_s\gamma$ Summary

Belyaev

- LHCb has a good physics potential for study of radiative B-decays

	N/year	B/S @90%CL
$B_d \to K^{*0}\gamma$	35k	<0.7
$B_s \to \phi\gamma$	9.3k	<2.4
$B_d \to \omega\gamma$	40	<3.5
$\Lambda_b \to \Lambda^0\gamma$	750	<42
$\Lambda_b \to \Lambda(1520)\gamma$	4.2k	<10
$\Lambda_b \to \Lambda(1670)\gamma$	2.2k	<18
$\Lambda_b \to \Lambda(1690)\gamma$	2.2k	<18

The *statistical* error on $A_{dir}(B\to K^{*0}\gamma)$ is well below 1%

The *statistical* error on V_{td}/V_{ts} from $B\to K^{*0}\gamma$ and $B\to\omega\gamma$ of about $O(0.1\sqrt{(1+B/S)/N})$

15% sensitivity to γ_R after 5 years

$$\mathscr{L}_{\rm eff} = \mathscr{L}_{\rm gauge}(A_i, \psi_i) + \mathscr{L}_{\rm Higgs}(\phi_i, A_i, \psi_i ; Y) + \sum_{d\geq 5} \frac{c_n}{\Lambda^{d-4}} O_n^{\,d}(\phi_i, A_i, \psi_i)$$

- 3 identical fermion families ⇒ huge flavour-degeneracy:
- partial breaking of the flavour group:

$$\mathscr{L}_{\rm Yukawa} = \bar{Q}_L Y_D D_R \phi + \bar{Q}_L Y_U U_R \phi_c + \bar{L}_L Y_L e_R \phi + \text{h.c.}$$

$(\bar{3},1,1)$ $(3,1,\bar{3})$ $(1,1,3)$

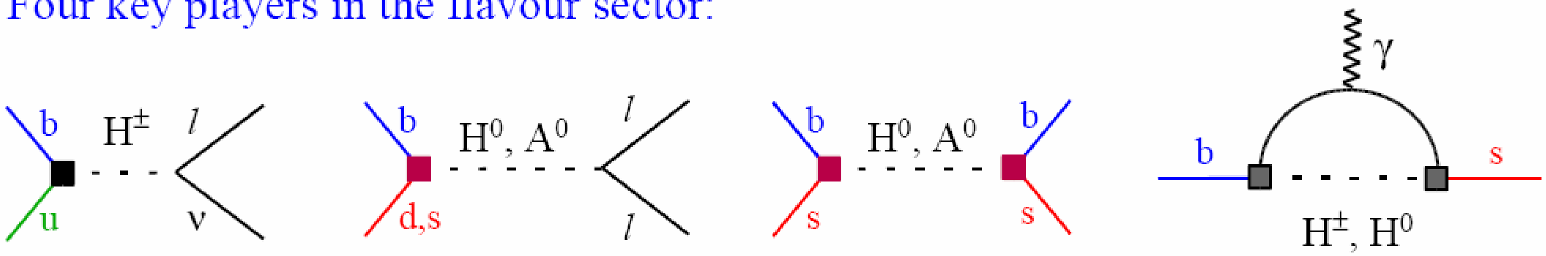
convenient to treat the Y
[& any additional source of flavour sym.breaking]
as spurions of

$$U(3)^5 = SU(3)_{Q_L} \times SU(3)_{U_R} \times SU(3)_{D_R} \times \ldots$$

- MFV with 1 Higgs [or low tanβ] ⇒ no additional spurions
- MFV with multi Higgs ⇒ additional U(1) spurions
- NMFV ⇒ additional SU(3)-breaking spurions
- ⋮ ⋮

Minimal Flavour Violation at large tanβ

Four key players in the flavour sector:



$B^{\pm} \to l^{\pm}\nu$	$B_{s,d} \to l^+ l^-$	ΔM_{B_s}	$B \to X_s\gamma$
↓	↓	↓	↓
~(10-50)% suppression	up to 100 × enhancement	~(0-20)% suppression	~(10-50)% enhancement

[qualitative general features for M_H ~ 500 GeV & tanβ ~ 50]

Despite several new free parameters, the framework exhibits a well defined pattern of enhancements & suppressions (consistent with present data)

The recent experimental infos on $B(B^{\pm} \to l^{\pm}\nu)$ [Belle] & ΔM_{B_s} [CDF] allows us to explore this scenario more deeply

G.I. & P.Paradisi '06

Buras
Tarantino

Littlest Higgs Models without and with T-Parity

New particles: (with O(f) masses)

LH

Gauge Bosons: $W^{\pm}_H$, Z^0_H, A^0_H

Fermions: T

Scalars: $\Phi^{\pm}$,...

LHT

T-even Sector

SM Particles + T_+

T-odd Sector

Gauge Bosons: $W^{\pm}_H$, Z^0_H, A^0_H

Fermions: T_-, Mirror Fermions

Scalars: $\Phi^{\pm}$,...

Buras
Tarantino

Main Messages from
Blanke, AJB, Poschenrieder, CT, Uhlig, Weiler

- The LHT Model offers a useful playground for studying non-MFV interactions
- All the existing ``Problems´´ can be solved
- Large ~~CP~~-effects in $B^0_s - \bar{B}^0_s$ are allowed
- Mirror Fermions rescue the γ=-109° solution

The analysis of

$$B_{s,d} \to \mu^+\mu^-,\ B \to X_{s,d}\nu\bar{\nu},\ B \to X_{s,d}l^+l^-$$

$$K^+ \to \pi^+\nu\bar{\nu},\ K_L \to \pi^0\nu\bar{\nu},\ K_L \to \pi^0 l^+l^-$$

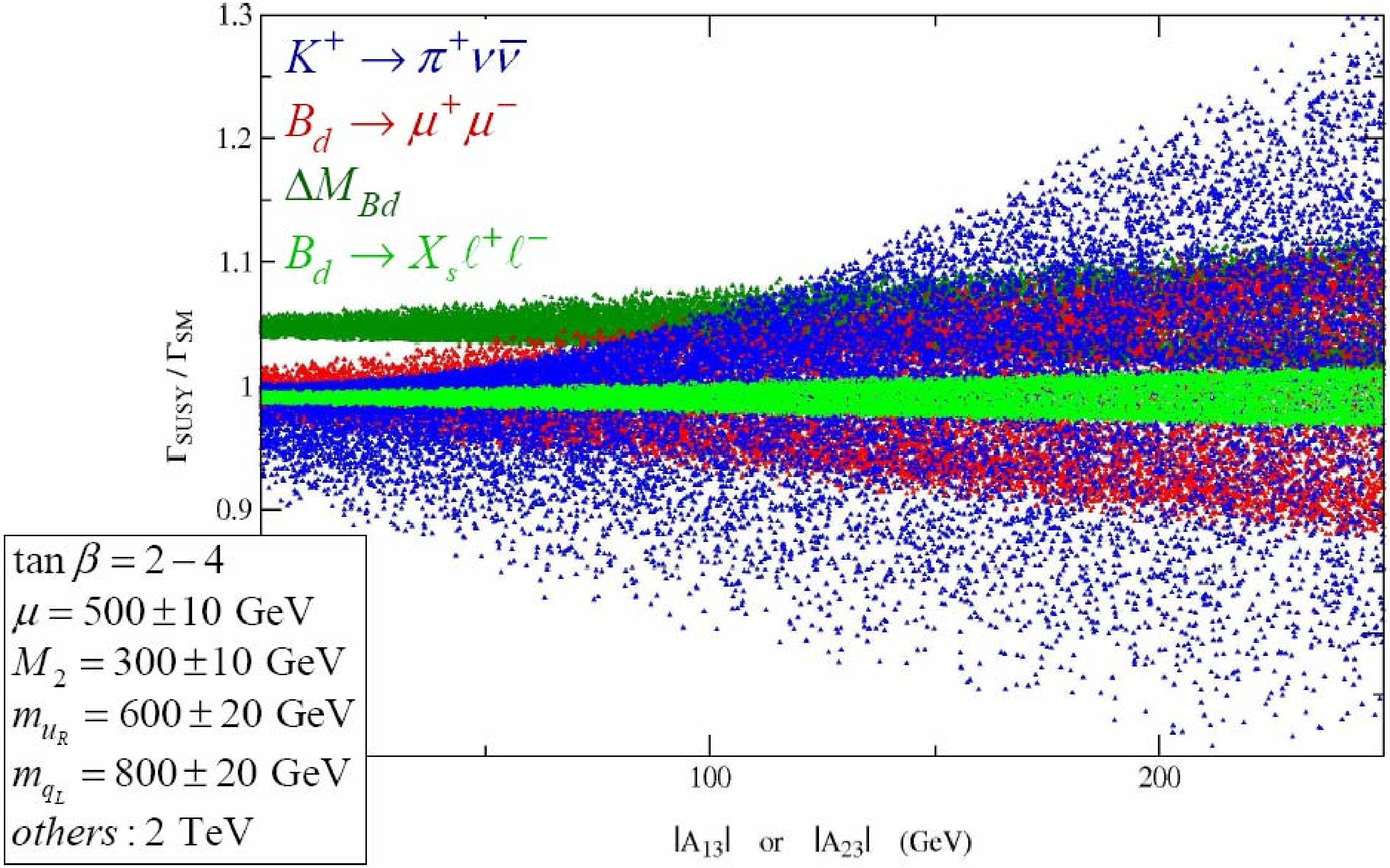
is coming soon !

Rare Kaon Decays

Smith

Large A_u

- Sensitivity $|\mathbf{A}_{13}|,|\mathbf{A}_{23}| \leq A_0\lambda,\quad A_0 = 1\ \mathrm{TeV}$, and phases left free.



B → VV can be useful

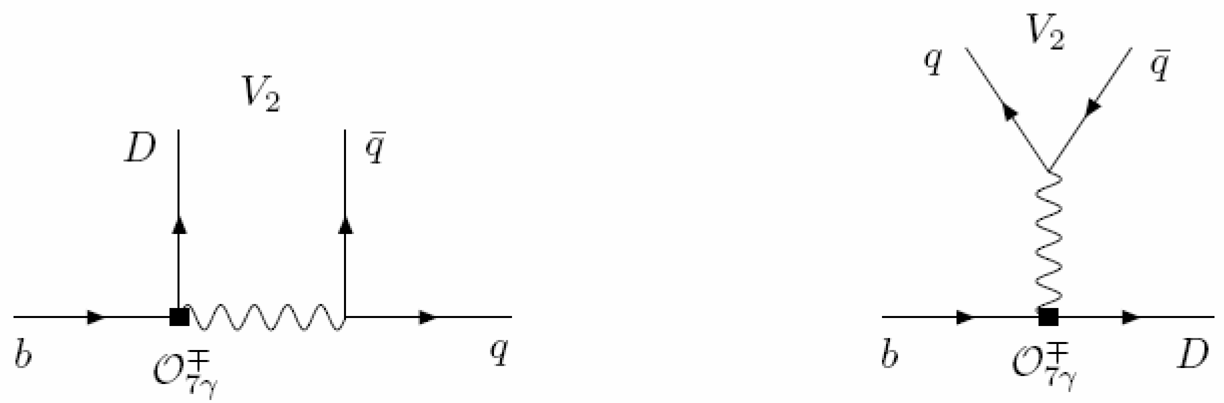
Beneke

- A determination of α [γ] $B^0 \to \rho^+\rho^-$ $B^+ \to K^{*0}\rho^+$

  (MB, M. Gronau, J. Rohrer, M. Spranger, to appear in PLB, hep-ph/0604005)

- Enhanced electroweak penguin (electromagnetic dipole – $O^{\mp}_{7\gamma}$) contributions in decays to transversely polarized vector mesons

  (MB, J. Rohrer, D. Yang, PRL 96 (2006) 141801, hep-ph/0512258)



CP Symmetry and Time Reversal in $\Lambda_b \to \Lambda V(1^-)$

An Experimentalist-Theorist Collaboration

"Λ_b Decays into Λ-Vector", Physics Letters B614 (2005), 165-173;
"Testing Fundamental symmetries with Λ_b Decays", hep-ph/0602043;
"Analysis of $\Lambda_b \to \Lambda J\psi$", LHCb Physics 2005-067

E. Conte[1], Z.J. Ajaltouni[1], O. Leitner[2]

Alpha from B → ππ

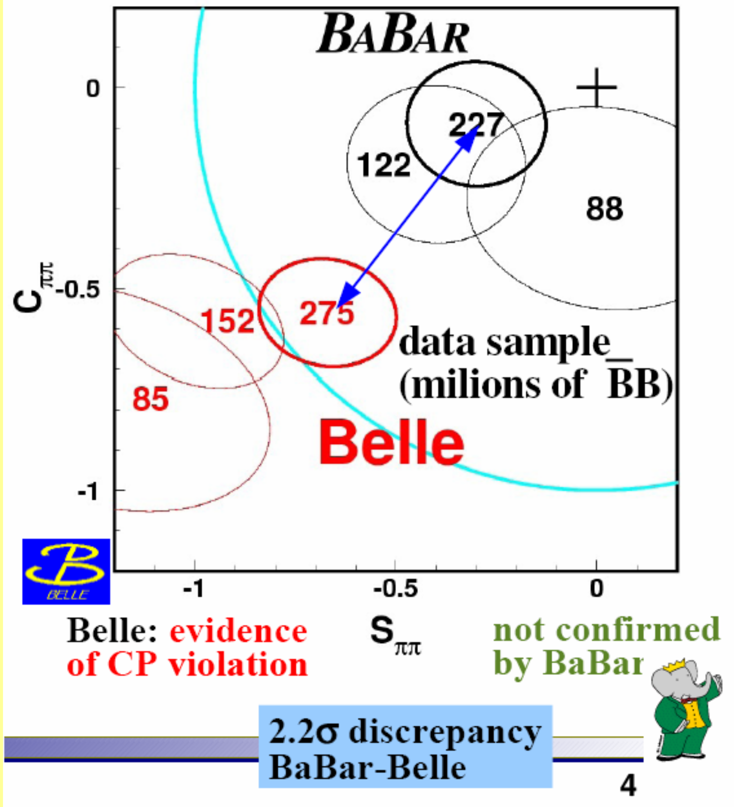
Vysotsky

- The moduli of the amplitudes A_0 and A_2 are given with good accuracy by factorisation; FSI phase shift is very large, $\delta \approx 50^o$.
- Theoretical uncertainty of the value of α extracted from $B \to \pi\pi$ data on S_{+-} is at the level of few degrees.
- Resolution of the contradiction of Belle and BABAR data on CP asymmetries are very important both for checking the correctness of our approach (C) and determination of angle α (S).

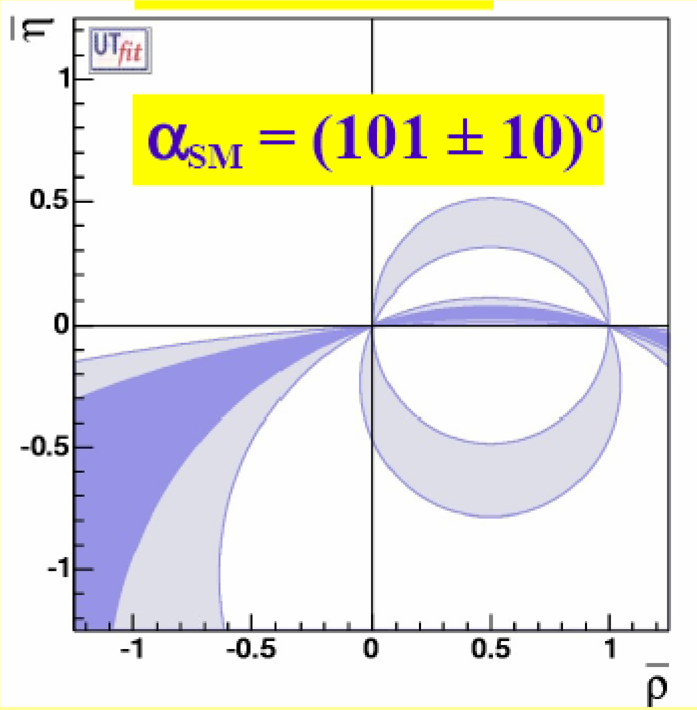
Current status of alpha

Bona

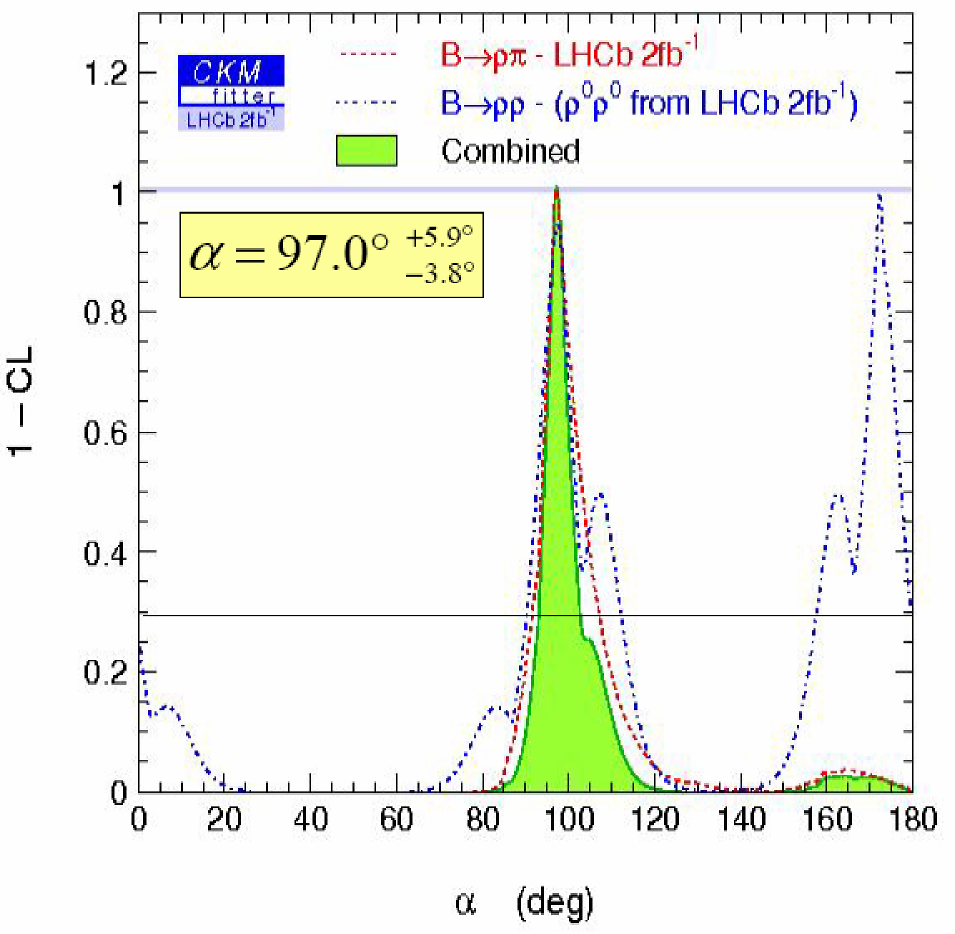
$B^0 \to \pi^+\pi^-$

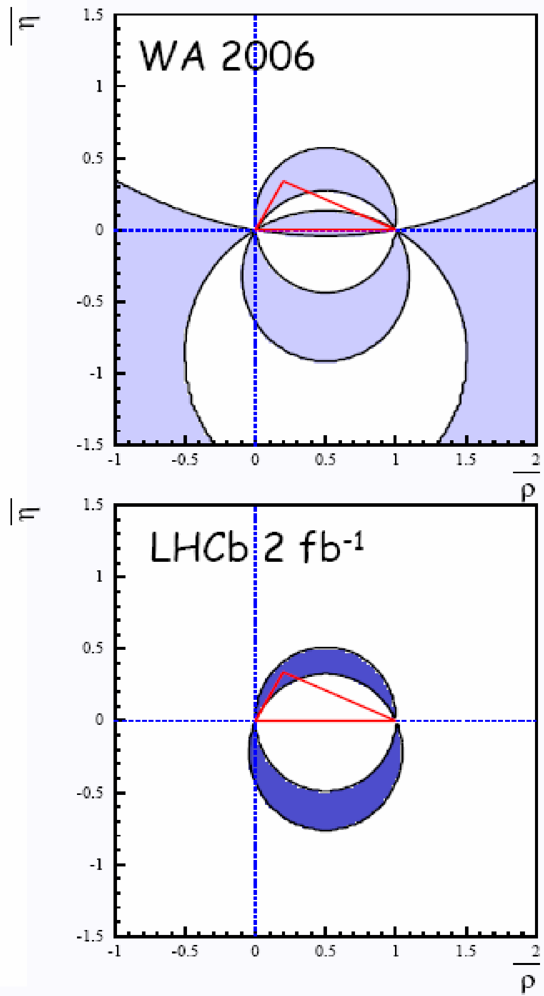


$B \to \rho\rho,\ \pi\pi,\ \rho\pi$



Prospective for 2fb^{-1} @ LHCb : ρρ/ρπ combination





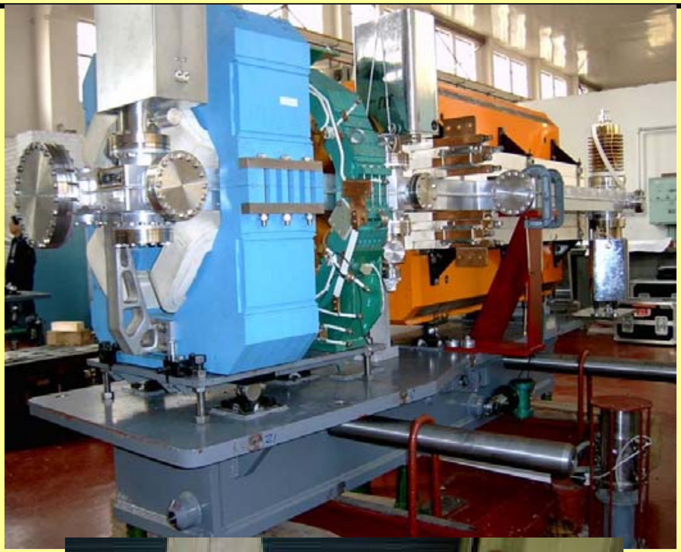
Deschamps

γ extraction with 4-body D decays in $B^{\pm} \to DK^{\pm}$

- Introduced new 4-body "Dalitz" method to extract γ. Successfully fitted γ to Toy-MC generated $B^{\pm} \to D(KK\pi\pi)K^{\pm}$ events.
- Extracting γ with using $B^{\pm} \to D(KK\pi\pi)K^{\pm}$ particularly suited to "messy" hadron environment: No tagging, no neutrals.
- Precision: $\sigma(\gamma) \sim 10^{o}$ for 1k events (no Bg, detector effects). Complementary to other B->DK methods - combined fit possible. Full study will be pursued within the context of LHCb.
- Alternative method introduced: Unbinned Dalitz *Asymmetries*. Acceptance effects cancel, but it's costly in stat. precision
- Method should work for other modes, eg. $B^{\pm} \to D(K\pi\pi\pi)K^{\pm}$ with 30 times larger BR (Cabbibo-supressed channel on its own has similar BR, but larger asymmetry due to ADS effect).

BEPC2/BESIII tau charm factory

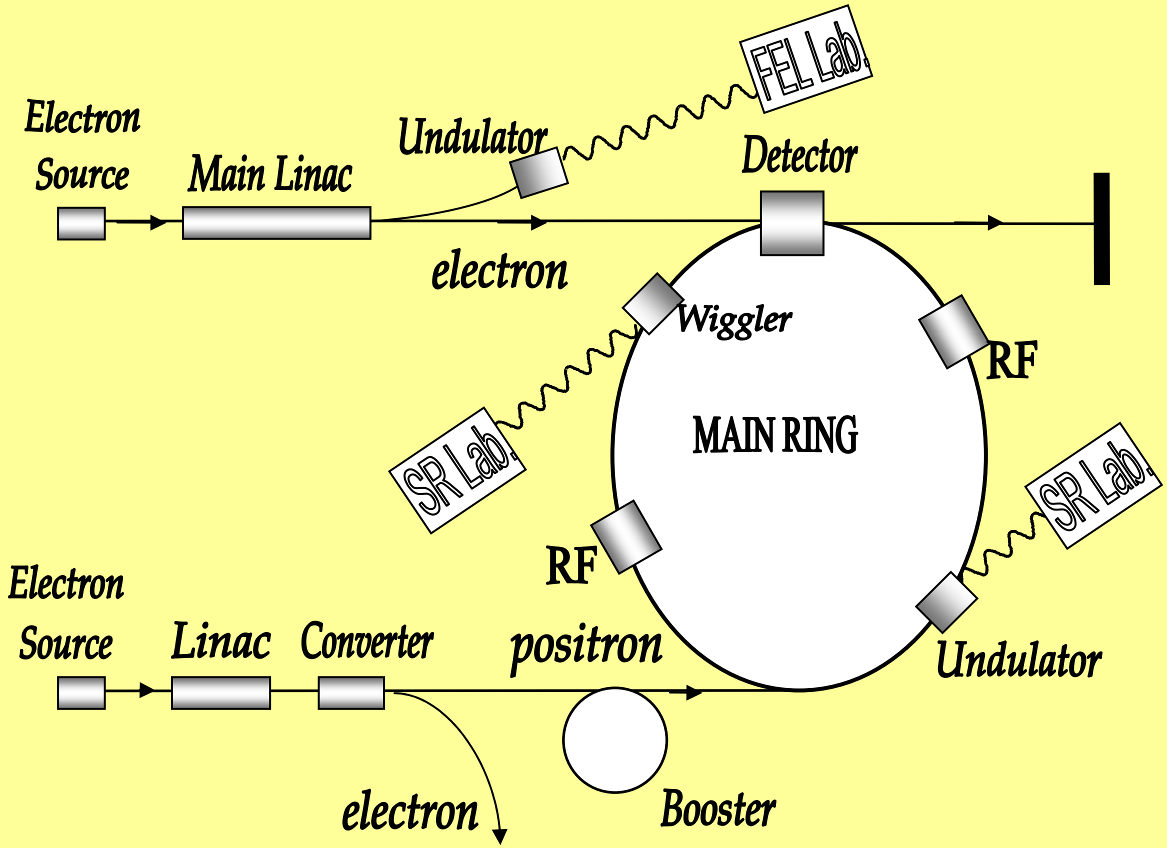
Asner



- **Beam collisions expected in spring 2007**
- **Design luminosity 10^{33} $cm^{-2}s^{-1}$.**

Turkic Accelerator Complex

Sultansoy



- Schematic view of the **TAC charm factory** complex
- TAC charm factory ($L=10^{34}\ cm^{-2}s^{-1}$), planned to work in mid 2010's, will contribute charm physics greatly.

WG2 Yellow Book Planning

Chapter 1: New Physics Scenarios (~40 p.)

- Overview (WG2 Conveners) (3 p.)
- SUSY (MFV, non-MFV, Specific) (Benchmark Models contact persons + contrib) (15 p.)
- Non-SUSY (Benchmark Models contact persons + contrib) (7 p.)
- Model independent analyses (Benchmark Models contact persons + contrib) (7 p.)
- Methods and tools (Tools contact persons + contrib) (8 p.)

Chapter 2: Hadronic Uncertainties (~20p.)

- Overview (WG2 Conveners)
- Non-perturbative input from lattice QCD
- Non-perturbative input from QCDSR
- Exclusive decays

(Buchalla + contrib)

Chapter 3: New Physics in Benchmark Channels (~100p.)

- Prospects for existing and future facilities (WG2 Conveners + contrib) (10 p.)
- Benchmark channels:
  - Radiative penguin decays (Gambino, Golutvin + contrib) (10 p.)
  - Electroweak penguin decays (Feldmann, Berryhill + contrib) (10 p.)
  - Neutrino modes (Grossman, Iijima + contrib) (10 p.)
  - Very rare decays (Nierste, Smizanska + contrib) (10 p.)
  - UT angles (tree-dominated) (Soni, Bona, Trabelsi, Wilkinson + contrib) (10 p.)
  - B_s mixing (Lubicz, van Hunen + contrib) (10 p.)
  - $b \to s$, $b \to d$ hadronic decays (Ciuchini, Muheim + contrib) (10 p.)
  - K decays (Buras, Komatsubara + contrib) (10 p.)
  - Charm decays (Fajfer, Asner + contrib) (10 p.)

Chapter 4: Assessments (~30p.)

- New physics patterns and correlations (WG2 Conveners + Isidori + Okada + contrib) (10 p.)
- Connections to high-pt and lepton physics (WG2 Conveners + Parodi + Heinemeyer + contrib) (10 p.)
- Discrimination between NP scenarios (WG2 Conveners + Isidori + Okada + contrib) (10 p.)

- Deadline for 1st draft 18 Sep 2006