

ϕ_3/γ section

Section Editors

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Theory , Ikaros Bigi

5th Workshop on the Physics of the B-factories Book

KEK, 22nd November 2011

Contributors

GLW, ADS

Belle: Karim Trabelsi

BaBar: Giovanni Machiori, Matteo Rama

GGSZ, Dalitz

Belle: Anton Poluektov

BaBar: Fernando Martinex - Vidal

$\sin(2\phi_1 + \phi_3)$

Belle: Gagan Mohanty

BaBar: Abi Soffer

Theory

Ikaros Bigi

all members now active

still need to bring I.Bigi into theory discussion

ϕ_3/γ section contents

- 14.8. 1. Introduction (including theory) and overview on approaches to measure γ
- Focus on GLW, ADS and GGSZ/Dalitz methods on $B^\pm \rightarrow D^{(*)}K^{(*)\pm}$ decays
 - 14.8.2. GLW $B^\pm \rightarrow DK^\pm$, $B^\pm \rightarrow D^*K^\pm$, $B^\pm \rightarrow DK^{*\pm}$
 - 14.8.3. ADS $B^\pm \rightarrow DK^\pm$, $B^\pm \rightarrow D^*K^\pm$, $B^\pm \rightarrow DK^{*\pm}$
 - 14.8.4. GGSZ/Dalitz $B^\pm \rightarrow DK^\pm$, $B^\pm \rightarrow D^*K^\pm$, $B^\pm \rightarrow DK^{*\pm}$
 - 14.8.4.1. Model dependent
 - 14.8.4.2. Model independent
- 14.8.5. $\sin(2\beta+\gamma)$ measurements (full and partial reco), shorter but complete overview
- 14.8.6. Other channels (e.g. ADS and GGSZ with neutral B decays) that do not bring much information but that are interesting for future facilities will be briefly review
- 14.8.7. Combination of results (from GLW, ADS and GGSZ methods)

⇒ **predicted 25/30 pages**

BaBar papers

Method	Channel	Stat (MBB)	Last publication	Status/ Expected
GLW	$B^\pm \rightarrow DK^\pm$	467	PRD82, 072004 (2010)	Final
GLW	$B^\pm \rightarrow D^*K^\pm$	383	PRD78, 092002 (2008)	Final
GLW	$B^\pm \rightarrow DK^{*\pm}$	379	PRD80, 092001 (2009)	Final
ADS	$B^\pm \rightarrow D^{(*)}K^\pm$	467	PRD82, 072006 (2010)	Final
ADS	$B^\pm \rightarrow DK^\pm, D \rightarrow K\pi\pi^0$	474	arXiv:1104.4472→PRD(R)	Final
ADS	$B^\pm \rightarrow DK^{*\pm}$	379	PRD80, 092001 (2009)	Final
GGSZ model dep.	$B^\pm \rightarrow D^{(*)}K^{(*)\pm}$	468	PRL105, 121801 (2010)	Final
$\sin(2\beta+\gamma)$ full reco	$B^0 \rightarrow D^*\pi^\pm/D\rho^\pm$	232	PRD73, 111101(R) (2006)	Final
$\sin(2\beta+\gamma)$ par reco	$B^0 \rightarrow D^*\pi^\pm$	232	PRD71, 112003 (2005)	Final
r_B for $D^{(*)}\pi$	$B^0 \rightarrow D_s^{(*)}\pi^\pm/\rho^\pm/K^\pm$	381	PRD78, 032005 (2008)	Final
ADS	$B^0 \rightarrow DK^{*0}$	465	PRD80, 031102(R) (2009)	Final
GGSZ model dep.	$B^0 \rightarrow DK^{*0}$	371	PRD79, 072003 (2009)	Final
GGSZ model dep.	$B^\pm \rightarrow DK^\pm$	324	PRL99, 251801 (2007)	Final

Belle papers (Annecy workshop status)

Method	Channel	Stat (MBB)	Last publication	Status/ Expected
GLW	$B^{\pm} \rightarrow D^{(*)}K^{\pm}$	275	PRD73, 051106(R) (2006)	End 2011
ADS	$B^{\pm} \rightarrow DK^{\pm}$	772	PRL106, 231803 (2010)	Final
ADS	$B^{\pm} \rightarrow D^*K^{\pm}$			End 2011
GSZ model dep.	$B^{\pm} \rightarrow D^{(*)}K^{\pm}$	657	PRD81, 112002 (2010)	Final
GSZ model dep.	$B^{\pm} \rightarrow DK^{*\pm}$	386	PRD73, 112009 (2006)	Final
GSZ model indep.	$B^{\pm} \rightarrow DK^{\pm}$	772	arXiv:1106.4046	End 2011
$\sin(2\beta+\gamma)$ full reco	$B^0 \rightarrow D^{(*)}\pi^{\pm}$	386	PRD 73, 092003 (2006)	End 2011
$\sin(2\beta+\gamma)$ par reco	$B^0 \rightarrow D^*\pi^{\pm}$	657	arXiv:1102.0888→PRD(R)	Final
r_B for $D\pi$	$B^0 \rightarrow D_s\pi^{\pm}/K^{\pm}$	657	PRD 82, 051103(R) (2010)	Final
r_B for $D^*\pi$	$B^0 \rightarrow D_s^*\pi^{\pm}/K^{\pm}$	657	PRD 81, 031101(R) (2010)	Final
r_B for $D^*\pi$	$B^{\pm} \rightarrow D^{*\pm}\pi^0$	657	PRL 101, 041601 (2008)	Final

(4)

(3)

(2)

(1)

(1) published as Phys. Rev. D 84, 021101(R) (2011)

(2) publication ready, should be submitted to journal by end of 2011

(3) new results (D^*K) shown this summer

(4) new results (DK) shown this summer

First evidence for the ADS mode $B^- \rightarrow [K^+ \pi^-]_{D^*} K^-$ from Belle 772 million $B\bar{B}$ events

Preliminary
LP 2011

study both modes: $D^* \rightarrow D\pi^0, D\gamma$:

**Signal seen
with a significance of 3.5σ
for $D^* \rightarrow D\gamma$ mode**

Ratio to favored mode:

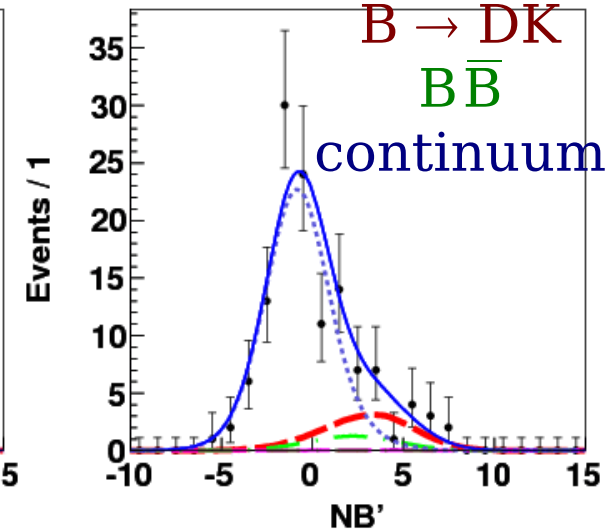
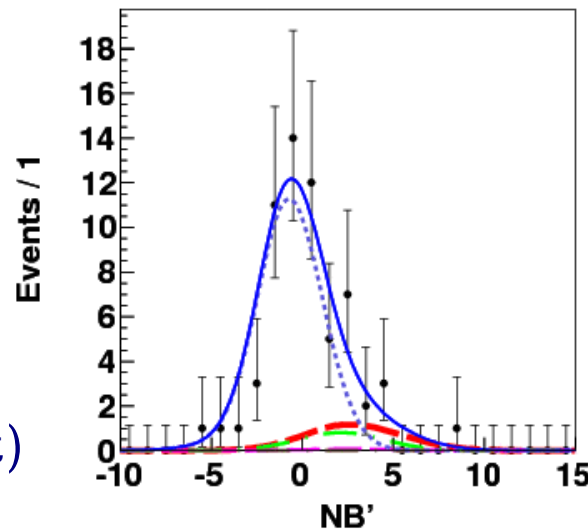
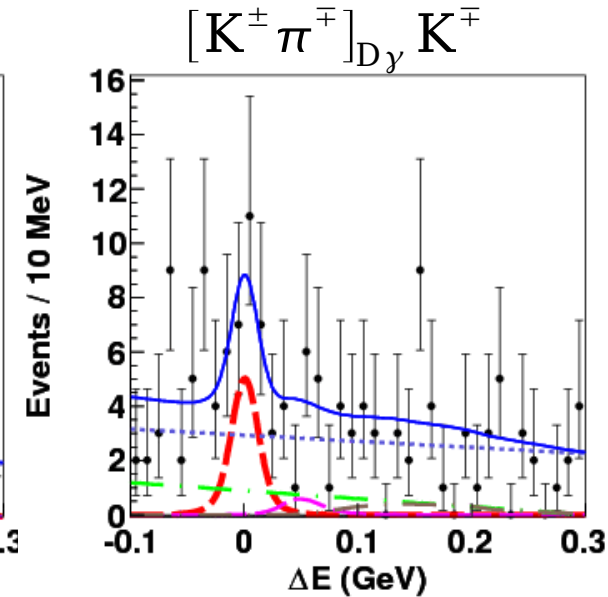
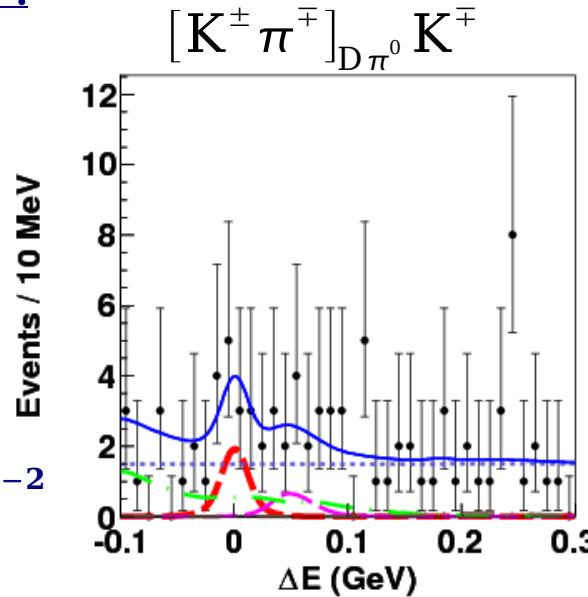
$$R_{D\pi^0} = (1.0_{-0.7}^{+0.8}(\text{stat})_{-0.2}^{+0.1}(\text{syst})) \times 10^{-2}$$

$$R_{D\gamma} = (3.6_{-1.2}^{+1.4}(\text{stat}) \pm 0.2(\text{syst})) \times 10^{-2}$$

asymmetry:

$$A_{D\pi^0} = 0.4_{-0.7}^{+1.1}(\text{stat})_{-0.1}^{+0.2}(\text{syst})$$

$$A_{D\gamma} = -0.51_{-0.29}^{+0.33}(\text{stat}) \pm 0.08(\text{syst})$$



Preliminary
LP 2011

$B \rightarrow Dh, D \rightarrow K\pi$

data (772 MB \bar{B})

$B \rightarrow D\pi$

$B \rightarrow DK$

$B\bar{B}$
continuum

continuum

$D \rightarrow K^+ K^-, \pi^+ \pi^-$

h is a kaon candidate (KID > 0.6)

$B^- \rightarrow Dh^-$

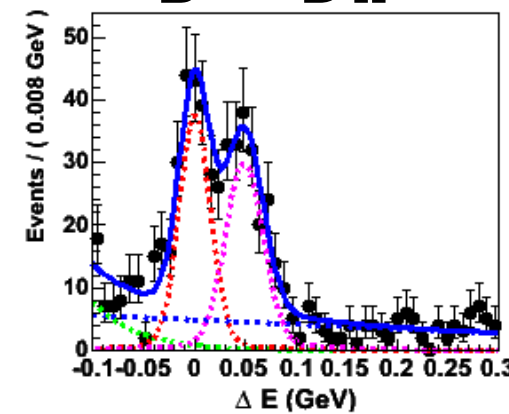
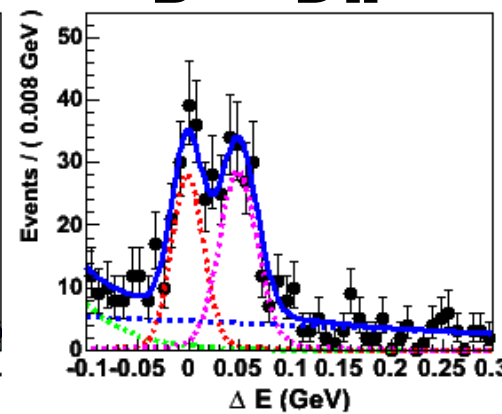
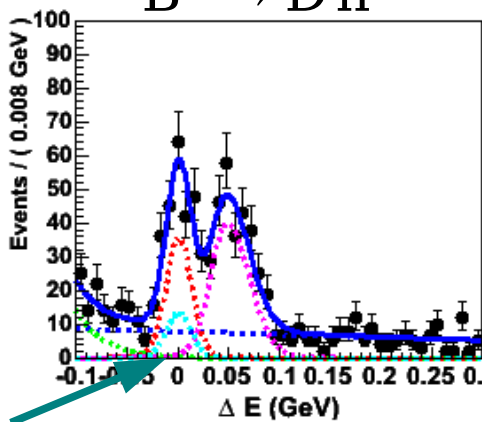
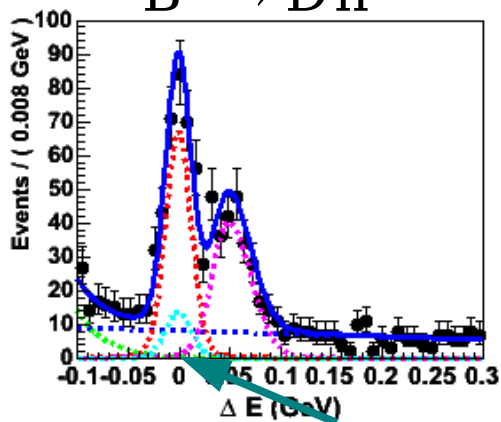
$B^+ \rightarrow Dh^+$

$D \rightarrow K_S \pi^0, K_S \eta (\gamma\gamma)$

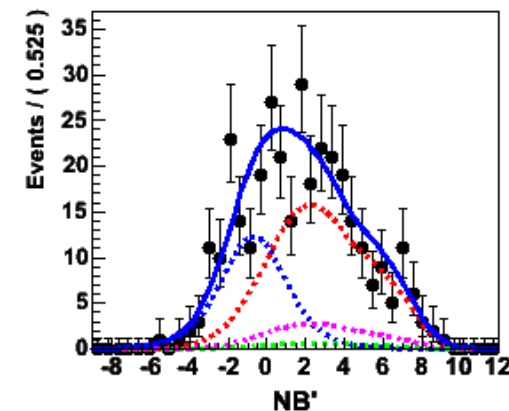
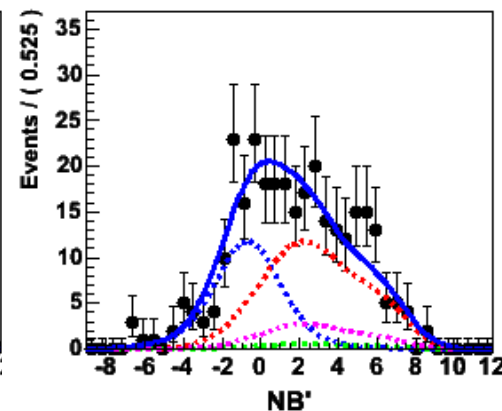
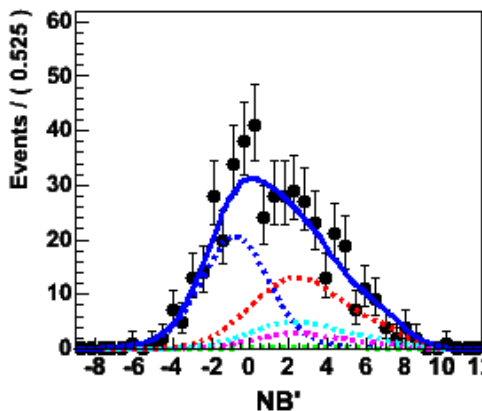
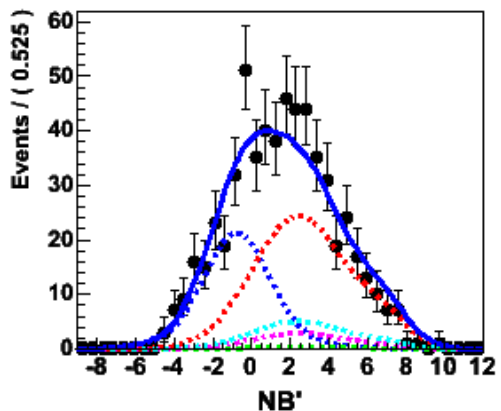
h is a kaon candidate (KID > 0.6)

$B^- \rightarrow Dh^-$

$B^+ \rightarrow Dh^+$



large KKK contribution !!



$$R_{CP+} = 1.03 \pm 0.07 \pm 0.03$$

$$R_{CP-} = 1.13 \pm 0.09 \pm 0.05$$

$$A_{CP+} = +0.29 \pm 0.06 \pm 0.02$$

$$A_{CP-} = -0.12 \pm 0.06 \pm 0.01$$

Section status

Please clarify during the KEK meeting what is left to do in your opinion, and update your length estimate if you need to shorten it (so that we track your intentions).

GLW, ADS

- good progress in this section
- plots are missing (asym GLW DK, first ADS evidence)
- new Belle results included (ADS $D^* K$, GLW DK)
- GLW $D^* K$ to be included by winter conferences

GGSZ, Dalitz

- revised version of model-dep GGSZ expected soon
- corrections to be implemented

$\sin(2\phi_1 + \phi_3)$

- close to final version
- $\sin(2\phi_1 + \phi_3)$ constraint to be added
- all publications should be included ?

Discussion

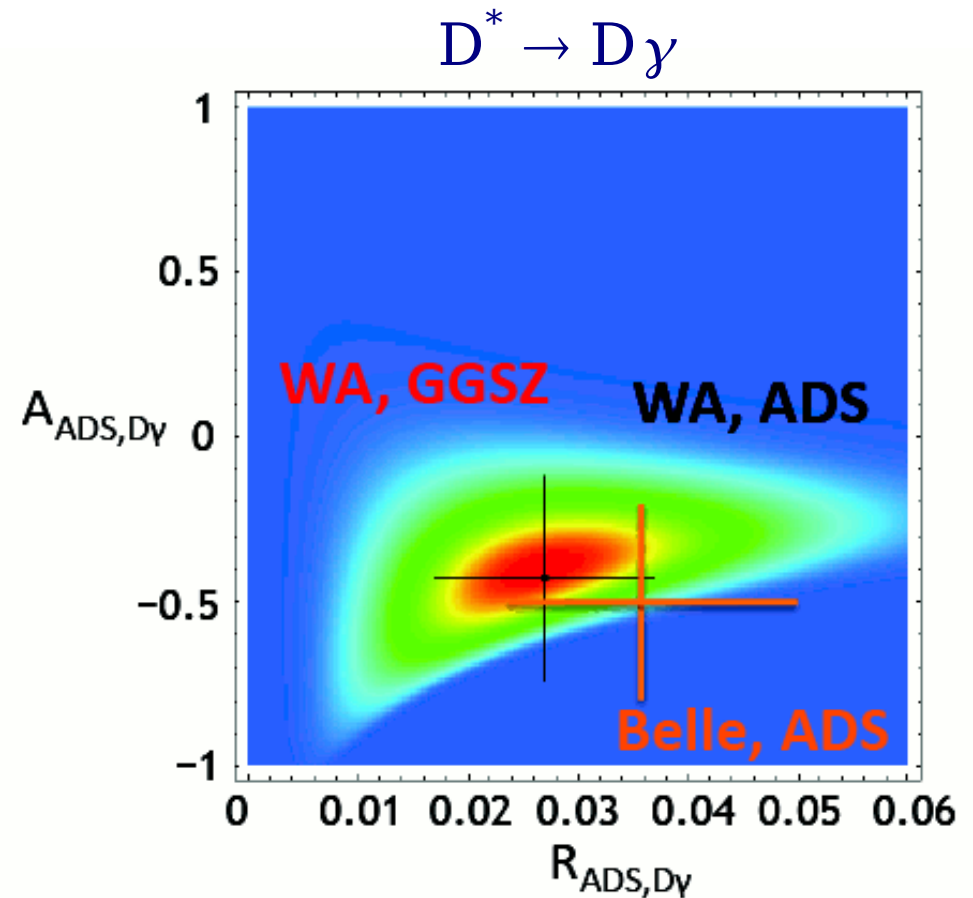
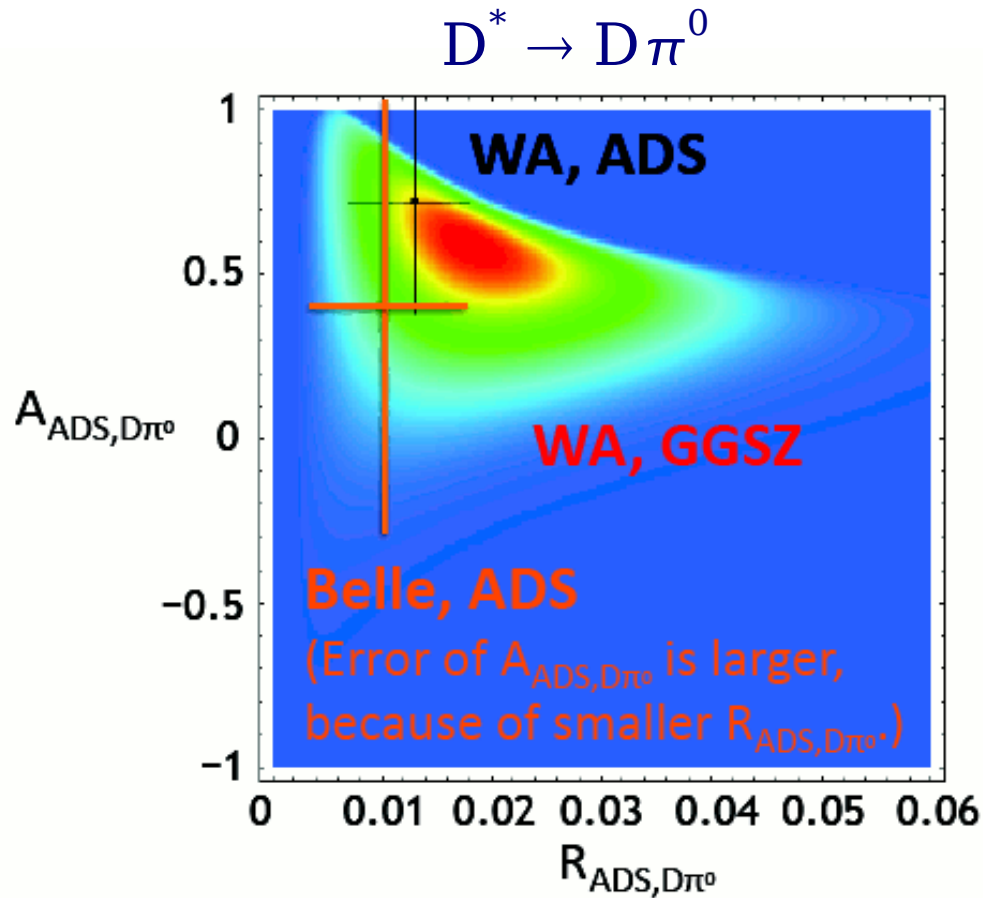
- comparison of the results of different methods
- combination of the results (plugin method ?)

⇒ **total ~ 20 pages**

⇒ **almost final by end of 2011**

Example: comparison of the results obtained for D^*K with expectations

(where 'expectations' are derived from the GGSZ observables)
use δ_D a la HFAG



WA taken from HFAG 2011 summer.