γ from $B \rightarrow DK$

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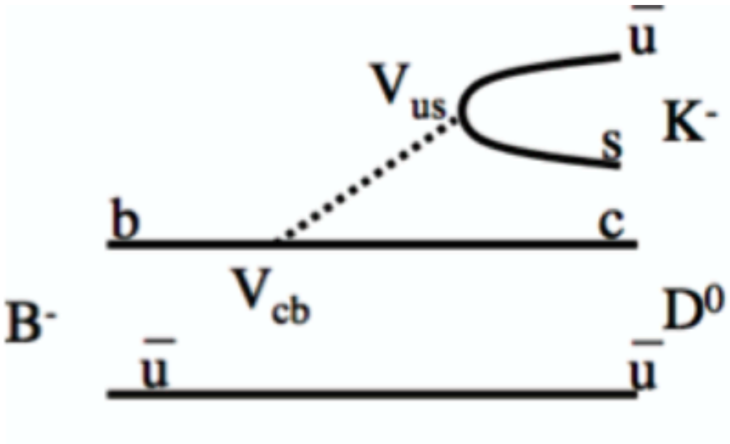
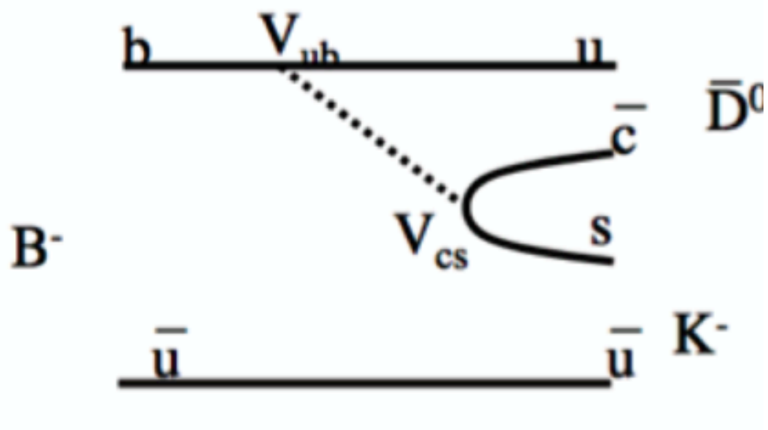
γ from B→DK

Use of B→DK decays is the cleanest way to measure γ:
- tree-level amplitude only
- tiny theoretical uncertainties

γ can be extracted exploiting the interference between the process $b \to c\bar{u}s$ ($B^- \to D^0 K^-$) and $b \to u\bar{c}s$ ($B^- \to \bar{D}^0 K^-$), when D^0 and $\bar{D}^0$ decay to the **same final state**





Favored $b \to c$ decay

$A_1 \sim V_{cb}V_{us}^* \sim \lambda^3$

Color suppressed $b \to u$ decay

$A_2 \sim V_{ub}V_{cs}^* \sim \lambda^3\, r_B\, e^{-i\delta B}\, e^{-i\gamma}$

γ from $B \to DK$

Several method to extract γ

- No tagging or time dependent analysis required

ADS method (PRL78,3257;PRD63,036005) uses the $B^\pm \to D K^\pm$ decays with D reconstructed in the doubly cabibbo suppressed $D^0_{DCS} \to K^+ \pi^-$

Expected large CP asymmetry
Decay suppressed by a factor of ~10^{-3} wrt favored
Results have to be combined with other methods to obtain γ measurement

Observables

$$R_{ADS}(h) = \frac{N(B^- \to D^0_{DCS} h^-) + N(B^+ \to D^0_{DCS} h^+)}{N(B^- \to D^0_{CF} h^-) + N(B^+ \to D^0_{CF} h^+)}$$

$$A_{ADS}(h) = \frac{N(B^- \to D^0_{DCS} h^-) - N(B^+ \to D^0_{DCS} h^+)}{N(B^- \to D^0_{DCS} h^-) + N(B^+ \to D^0_{DCS} h^+)}$$

h = K or π
$D^0_{CF} \to K^- \pi^+$
$D^0_{DCS} \to K^+ \pi^-$

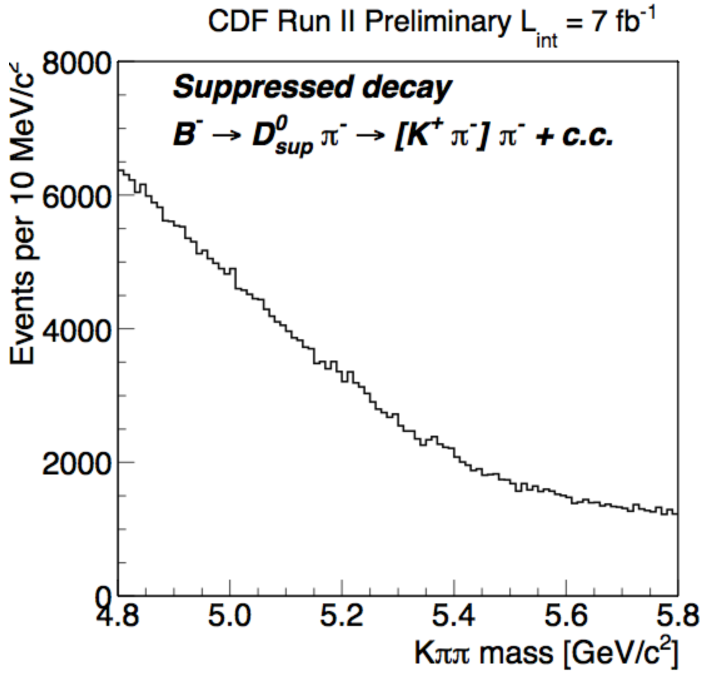
From theory:

$R_{ADS}(K) = r_D^2 + r_B^2 + 2 r_B r_D \cos(\delta_B + \delta_D) \cos\gamma$

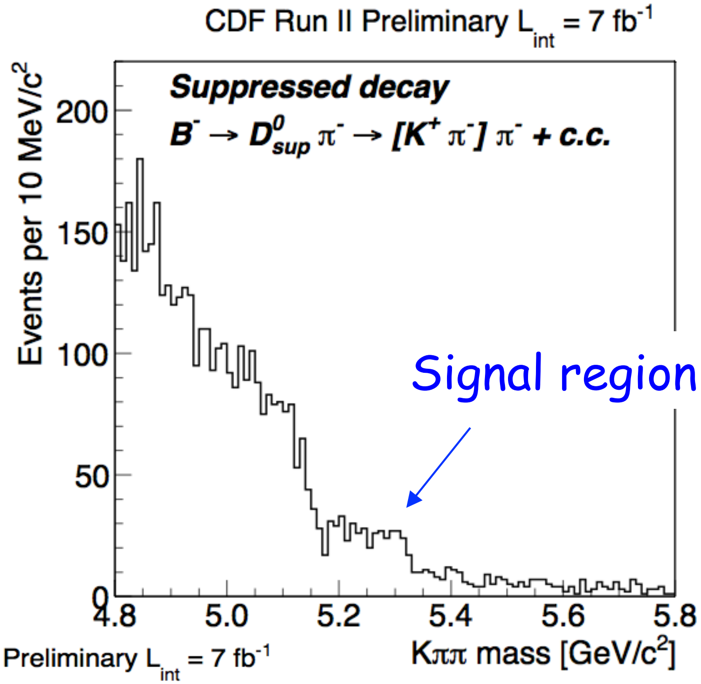
$A_{ADS}(K) = 2 r_B r_D \sin(\delta_B + \delta_D) \sin\gamma / R_{ADS}(K)$

γ from B→DK: Cuts Optimization

$B^- \to D^0_{DCS}\,\pi^- \to [K^+\,\pi^-]\,\pi^-$



Cut optimization: crucial step toward the DCS modes

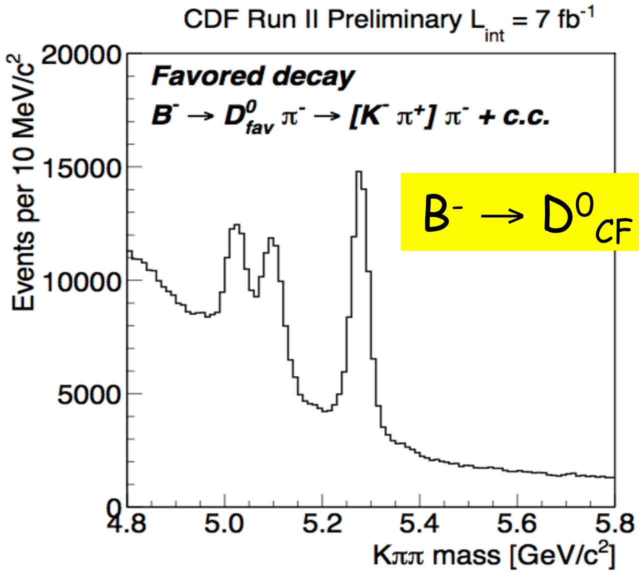


Maximize the quantity

$$\frac{S}{1.5+\sqrt{B}}$$

on CF sample.

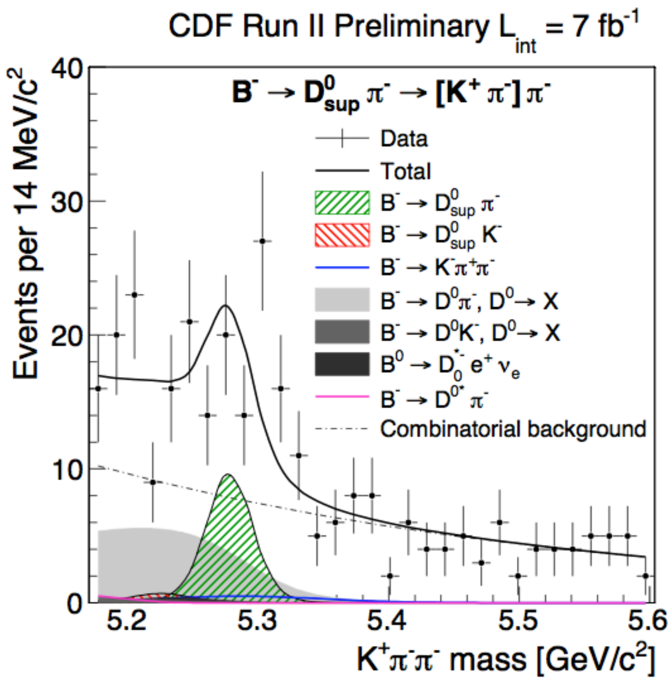
(arXiv:0808063v2)

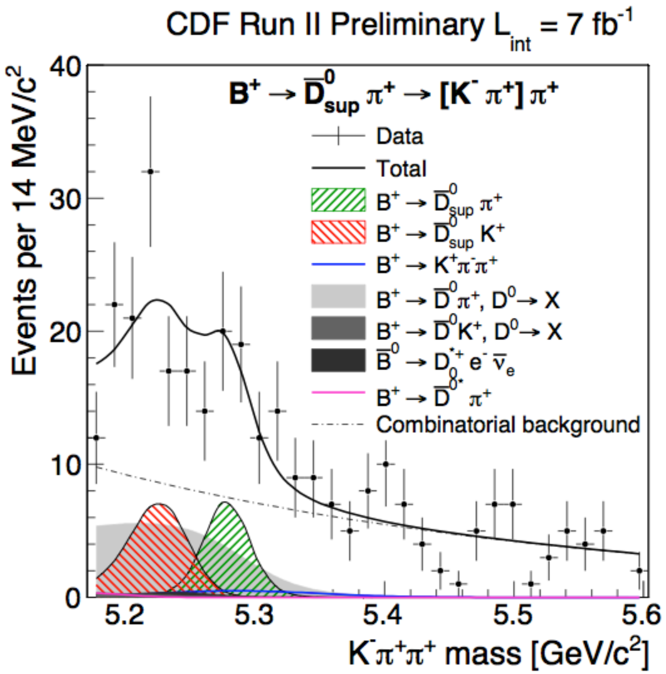


$B^- \to D^0_{CF}\,\pi^- \to [K^-\,\pi^+]\,\pi^-$

γ from B→DK: Results (L=7fb^{-1})

Implementation of an unbinned maximum likelihood FIT (combined on CF and DCS modes) using masses and particle identification (dE/dx) information to determine the signal composition





Yield (B→D_{DCS}K) = 32 ± 12
Yield (B→$D_{DCS}\pi$) = 55 ± 14

First evidence of B→D_{DCS}K signal at a hadron collider (3.2 σ)

γ from B→DK: Results (L=7fb^{-1})

$$R_{ADS}(p) = (2.8 \pm 0.7(stat) \pm 0.4(syst)) \cdot 10^{-3}$$

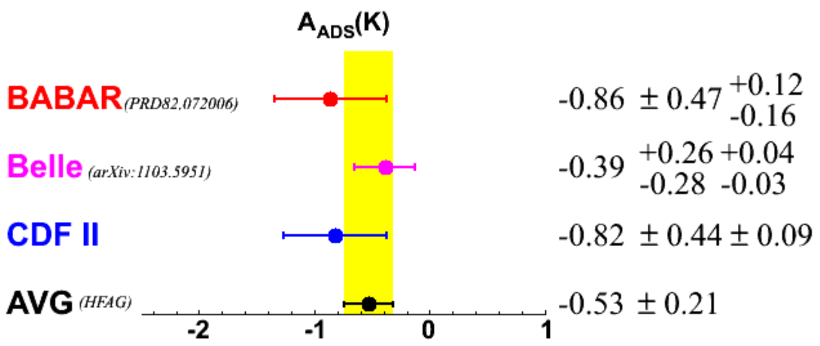
$$A_{ADS}(p) = 0.15 \pm 0.25(stat) \pm 0.01(syst)$$

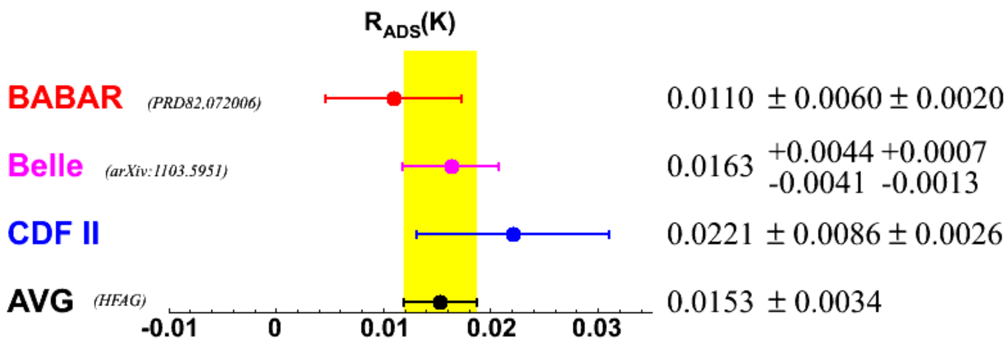
$$R_{ADS}(K) = (22.1 \pm 8.6(stat) \pm 2.6(syst)) \cdot 10^{-3}$$

$$A_{ADS}(K) = -0.82 \pm 0.44(stat) \pm 0.09(syst)$$

→ **2.2 σ far from zero**

- First measurement of A_{ADS} and R_{ADS} at a hadron collider.
- Agrees with previous measurements from other experiments.





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GLW method *([PLB253,483 PLB265,172])* uses the $B^{\pm} \to D K^{\pm}$ decays with D_{CP} modes $D_{CP+} \to K^+K^-, \pi^+\pi^-$, $D_{CP-} \to K^0_s\, \pi^0,\ K^0_s\, \omega,\ K^0_s\, \phi$.

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D mode	$B^+ \to D\pi^+$	$B^- \to D\pi^-$	$B^+ \to DK^+$	$B^- \to DK^-$
$K^-\pi^+$	3769 ± 68	3763 ± 68	250 ± 26	266 ± 27
K^+K^-	381 ± 25	399 ± 26	22 ± 8	49 ± 11
$\pi^+\pi^-$	101 ± 13	117 ± 14	6 ± 6	14 ± 6

L = 1 fb^{-1}

$$R_{CP+} = 1.30 \pm 0.24(stat) \pm 0.12(syst)$$
$$A_{CP+} = 0.39 \pm 0.17(stat) \pm 0.04(syst)$$