$D \to K^+K^-\pi^+\pi^-$ analysis at LHCb and BESIII

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Outline

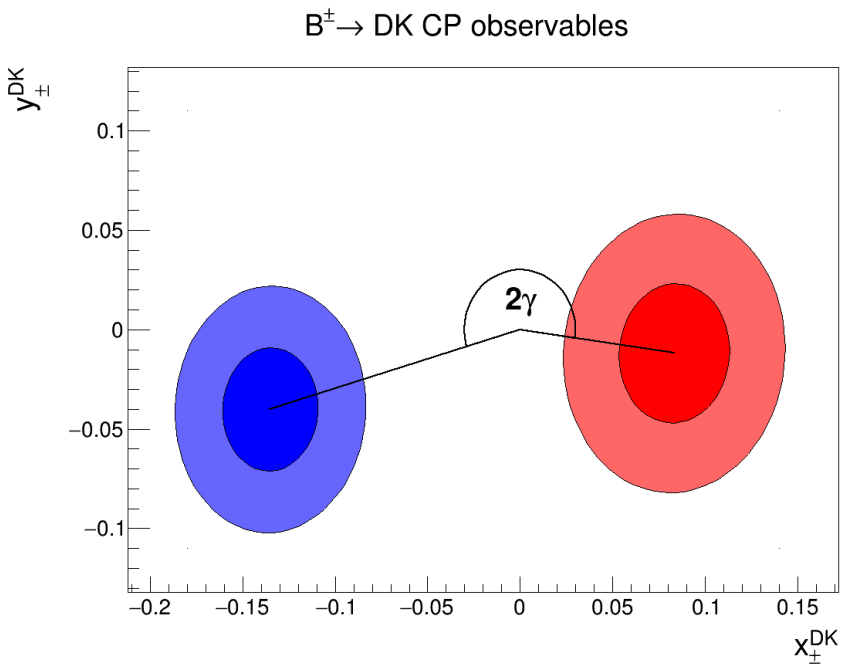
1. LHCb
   - Summary of LHCb analysis status
2. BESIII
   - Measurement of CP even fraction F_+
3. Summary

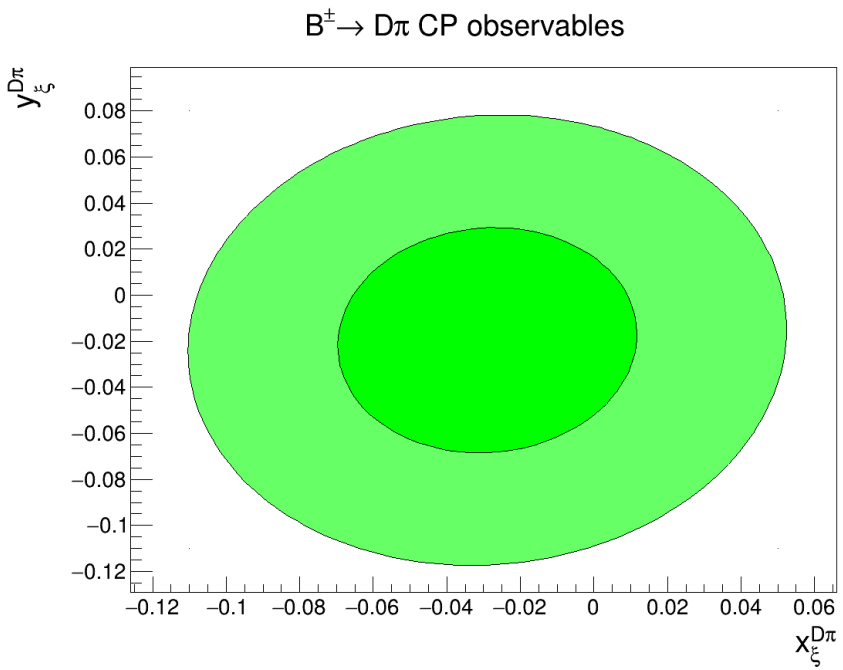
$$B^{\pm} \to (K^+K^-\pi^+\pi^-)_D h^{\pm}$$

GGSZ+GLW analysis at LHCb

Summary of LHCb analysis status

- Previously on γ measurement in $B^{\pm} \to Dh^{\pm}$, $D \to K^+K^-\pi^+\pi^-$:
  1. Model-independent binned GGSZ and inclusive GLW analysis
     - WG approval on 10th March
     - Received 1st comments from RC reviewers, replies sent back





Results for γ

$$\begin{aligned}\gamma &= (103 \pm 14)^\circ \\ \delta_B^{DK} &= (92 \pm 14)^\circ \\ r_B^{DK} &= 0.117 \pm 0.020 \\ \delta_B^{D\pi} &= (296 \pm 84)^\circ \\ r_B^{D\pi} &= 0.004 \pm 0.005\end{aligned}$$

- Sign error in the strong phase? $\gamma \to 180^\circ - \gamma$
- Unfortunately, sign error looks unlikely...
  - Interference fractions agree between LHCb and CLEO models
  - BESIII data seems to support the sign from the model

Resonance	LHCb model phase (rad)	CLEO model (rad)
$D^0 \to [\phi(1020)\rho^0]_{L=0}$	0 (fixed)	0 (fixed)
$D^0 \to K_1(1400)^+ K^-$	1.05	-1.79
$D^0 \to K_1(1270)^+ K^-$	2.02	-2.56

$$D \to K^+K^-\pi^+\pi^-$$

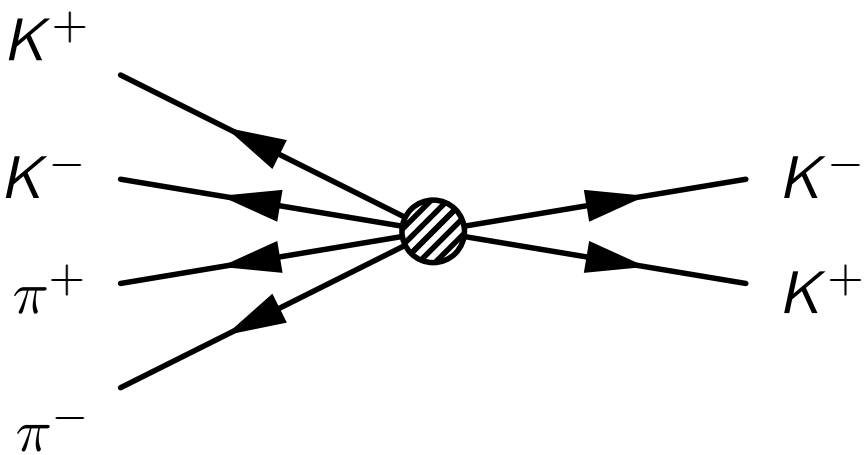
strong-phase analysis as BESIII

Measurement of CP even fraction F_+

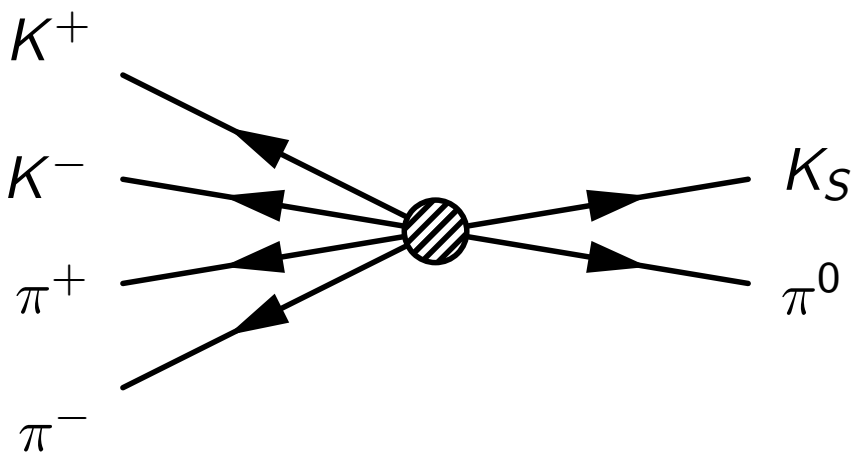
- BESIII: e^+e^- collider at $\psi(3770) \to D^0\bar{D}^0$ threshold
- Reconstruct signal mode $D \to KK\pi\pi$ and a tag mode $D \to f$
- Signal mode is quantum correlated with tag mode
- Measure BF with CP even/odd tags to determine F_+

$$\mathrm{BF}(KK\pi\pi|f) = \mathrm{BF}(KK\pi\pi) \times \left(1 - \lambda_{\mathrm{CP}}(2F_+ - 1)\right)$$

$$\mathrm{BF}(KK\pi\pi|f) = \mathrm{BF}(KK\pi\pi) \times \left(K_i + K_{-i} \mp 2\sqrt{K_i K_{-i}}c_i(2F_+ - 1)\right)$$

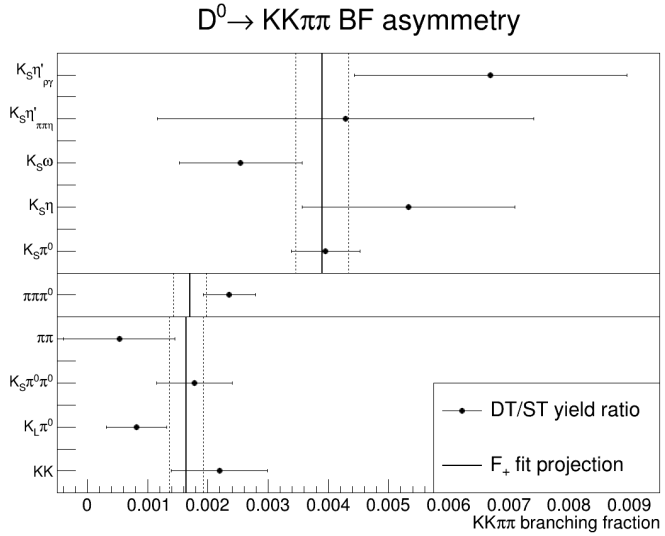


(a) CP even tag

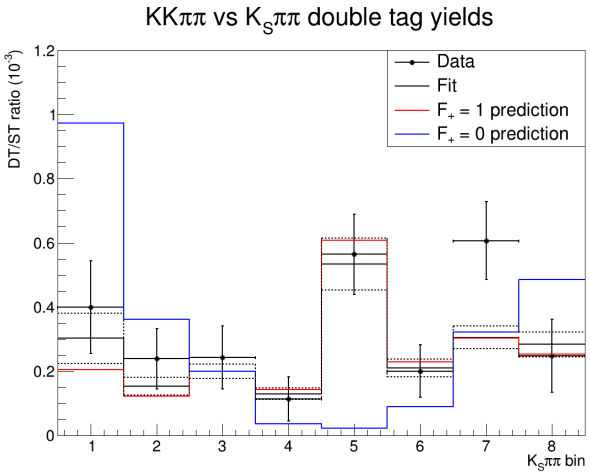


(b) CP odd tag

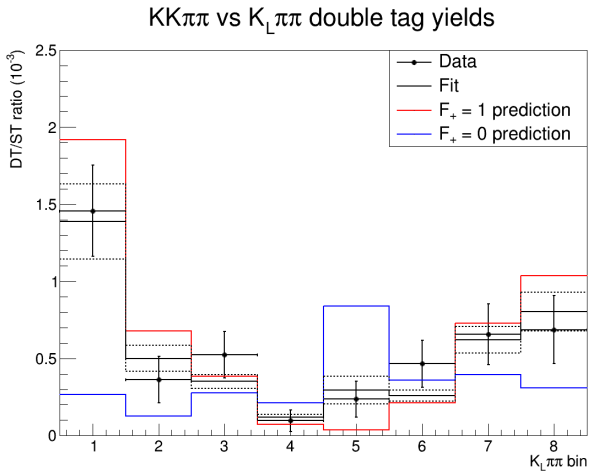
F_+ measurement with CP tags



(a) CP tags



(b) $K^0_S\pi^+\pi^-$ tag



(c) $K^0_L\pi^+\pi^-$ tag

Summary

- LHCb $B^{\pm} \to (K^+K^-\pi^+\pi^-)_D h^{\pm}$ GGSZ+GLW analysis:
  - Final result of GGSZ part: $\gamma = 103 \pm 14$
  - In RC, currently waiting for further comments
  - Sign of s_i remains uncertain
- BESIII $D \to K^+K^-\pi^+\pi^-$ strong-phase analysis:
  - Final result: $F_+ = 0.73 \pm 0.04$
    - First model independent measurement of F_+ for $D^0 \to K^+K^-\pi^+\pi^-$
  - Analysis required model-dependent efficiency corrections
  - Will present to BESIII on Friday 26th May before entering RC

Thank you!