BESIII Oxford Group Meeting

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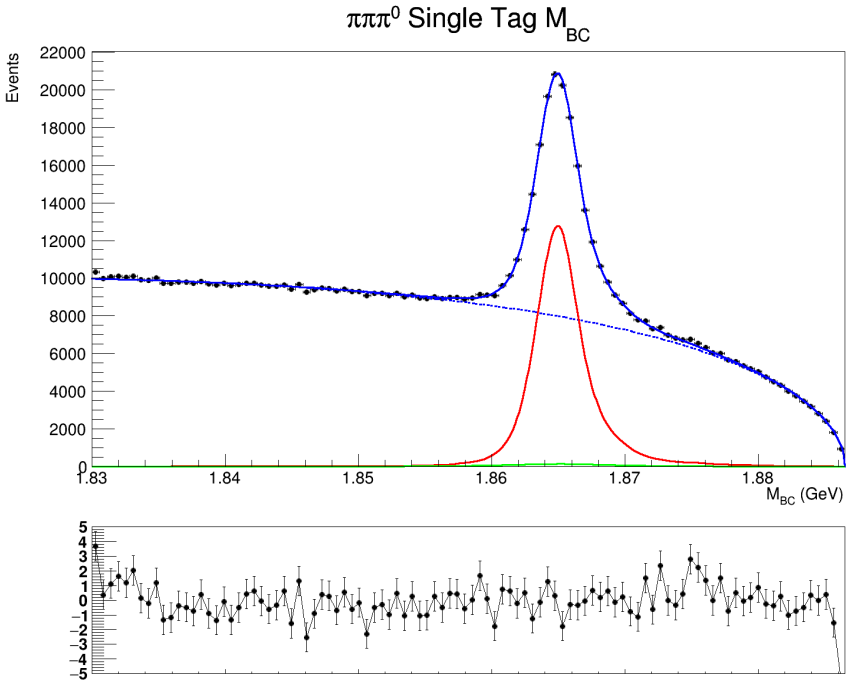
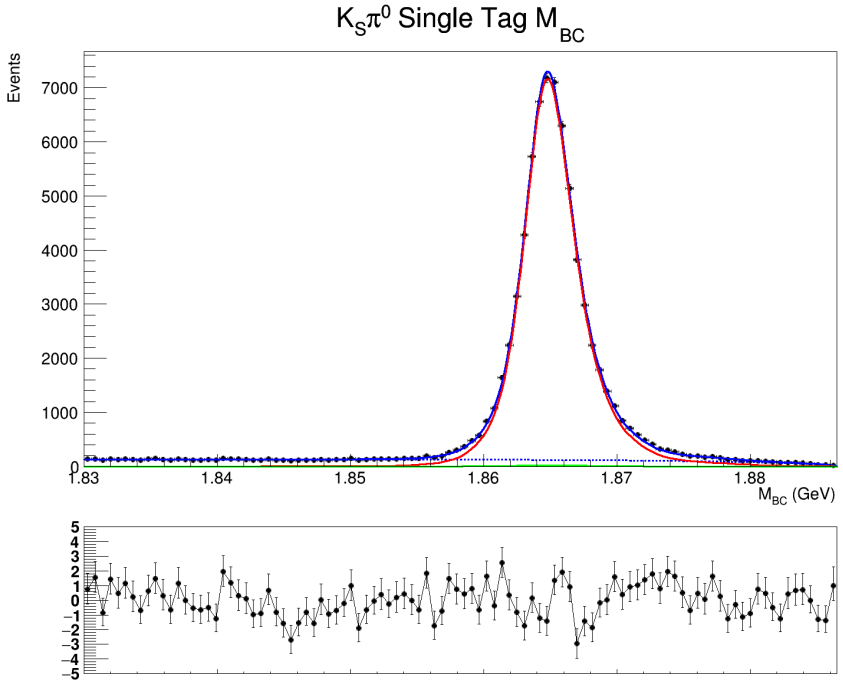
Introduction

- $D \to K^+K^-\pi^+\pi^-$ analysis
- Previously:
  - Obtained ST yield from fit to m_{BC}
  - $KK\pi\pi$, KK, $\pi\pi$
- Current progress:
  - Obtained ST yield for $K\pi$, $K\pi\pi^0$, $\pi\pi\pi^0$, $K_S\pi^0$, $K_S\pi^0\pi^0$, $K_S\eta$
  - Obtained DT yield for KK, $K_S\pi^0$, $K\pi$ using sideband background subraction

$\pi\pi\pi^0$ and $K_S\pi^0$ ST yield

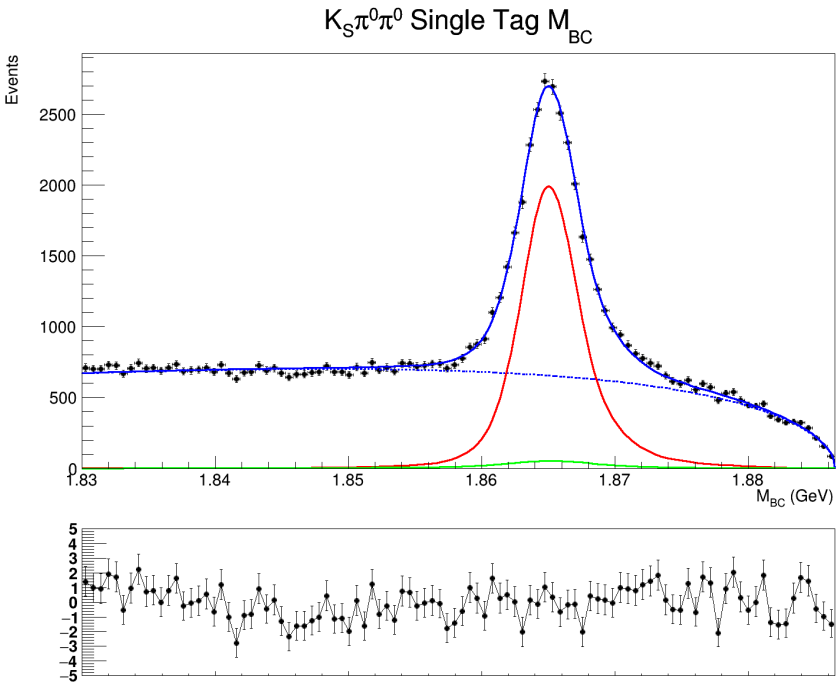


(a) $\pi\pi\pi^0$ m_{BC} fit

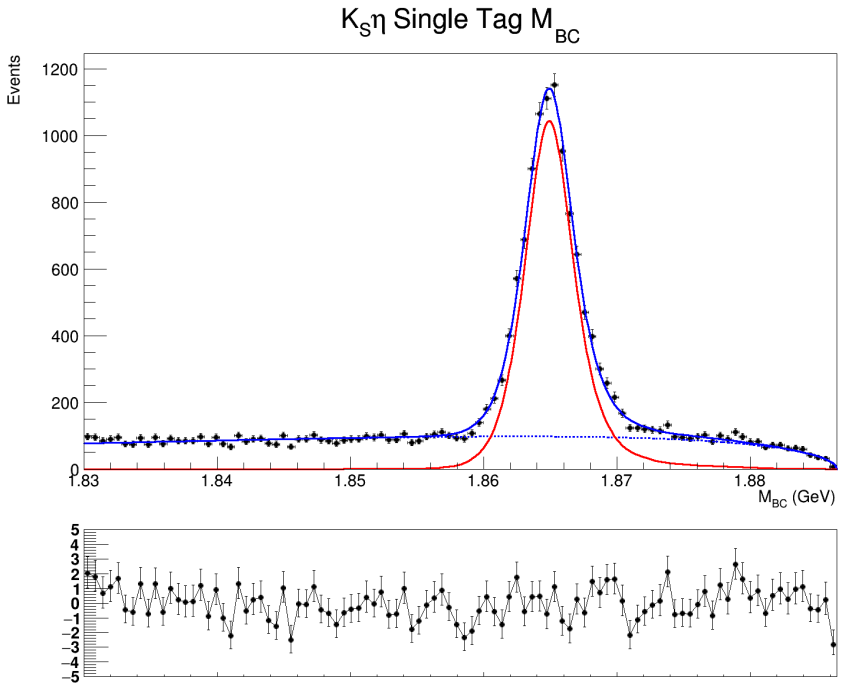


(b) $K_S\pi^0$ m_{BC} fit

$K_S\pi^0\pi^0$ and $K_S\eta$ ST yield

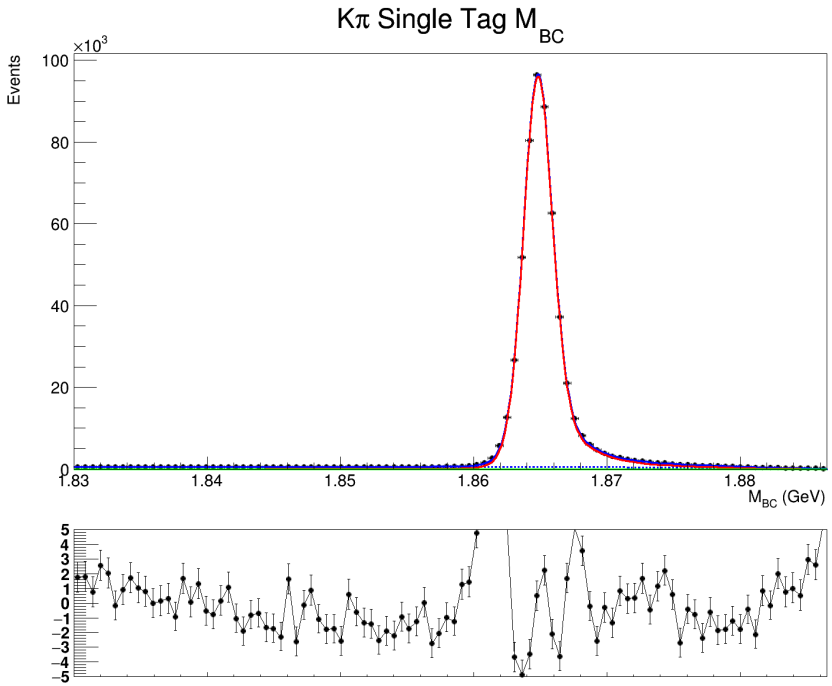


(a) $K_S\pi^0\pi^0$ m_{BC} fit

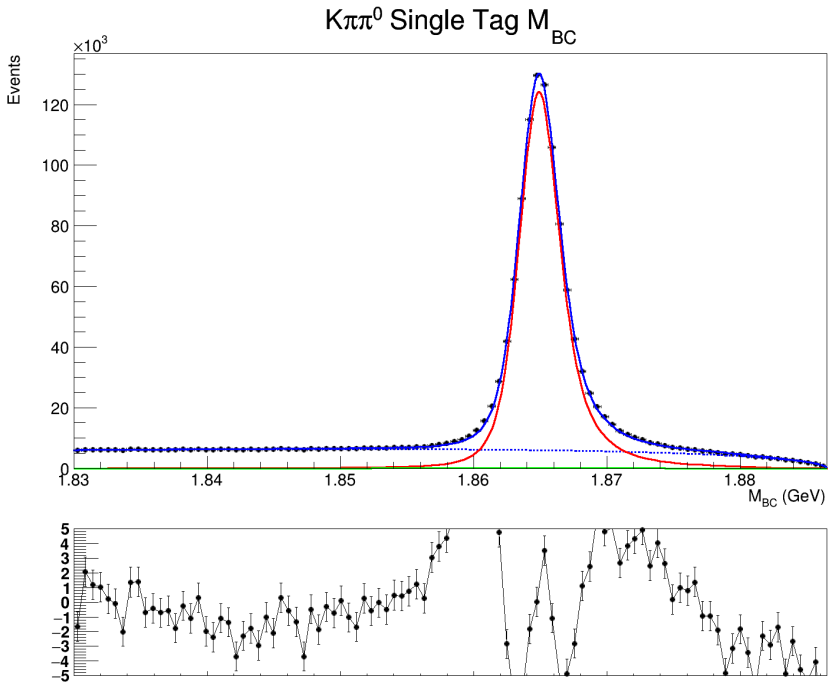


(b) $K_S\eta$ m_{BC} fit

$K\pi$ and $K\pi\pi^0$ ST yield



(a) $K\pi$ m_{BC} fit



(b) $K\pi\pi^0$ m_{BC} fit

Peaking backgrounds

- Shape and yield fixed from inclusive MC

Tag mode	Main peaking backgrounds(Yields)
$\pi\pi\pi^0$	$K_S\pi^0$ (1402), $K\pi$ (669), $K\pi\pi^0$ (153)
$K_S\pi^0$	$\pi\pi\pi^0$ (227)
$K_S\pi^0\pi^0$	K_SK_S (249), $K_S\pi^0\gamma$ (198), $K_S\eta$ (244)
	$\pi\pi\pi^0\pi^0$ (149), $K_S\pi^0$ (93), $K_S\pi\pi$ (57), $K\pi\pi^0$ (32)
$K_S\eta$	-
$K\pi$	Other (95), $Ke\nu$ (84), $K\mu\nu$ (72), $\pi\pi\pi^0$ (62)
$K\pi\pi^0$	$\pi\pi\pi^0$ (807), $K_S\pi\pi$ (483), $K\mu\nu\pi^0$ (169)
	$Ke\nu\pi^0$ (155), $K\pi\gamma^{\mathrm{FSR}}$ (139)

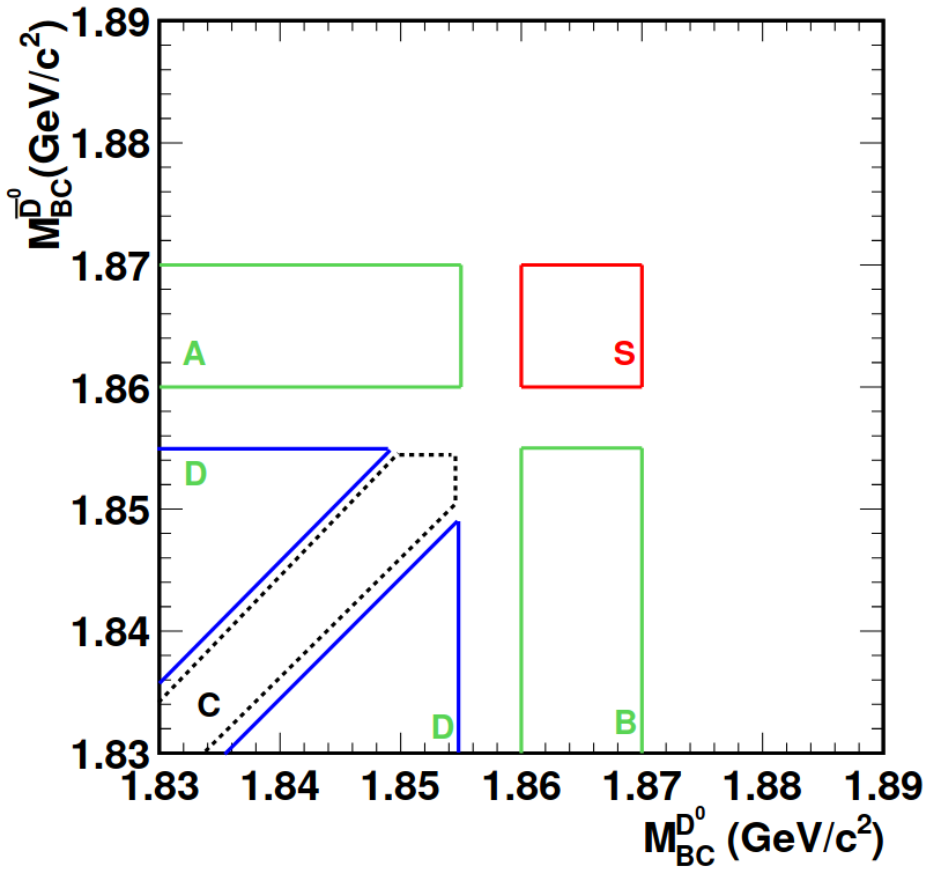
Single tag yields

Tag mode	Yield	Result from $K_S KK$ analysis
$\pi\pi\pi^0$	$97\,862 \pm 530$	$99\,981 \pm 618$
$K_S\pi^0$	$62\,357 \pm 255$	$65\,072 \pm 281$
$K_S\pi^0\pi^0$	$19\,259 \pm 195$	$19\,882 \pm 233$
$K_S\eta$	8732 ± 106	9524 ± 134
$K\pi$	$513\,561 \pm 725$	$261\,221 \pm 525/266\,086 \pm 525$
$K\pi\pi^0$	$914\,620 \pm 1044$	$496\,202 \pm 788/499\,481 \pm 792$

Double tag yields

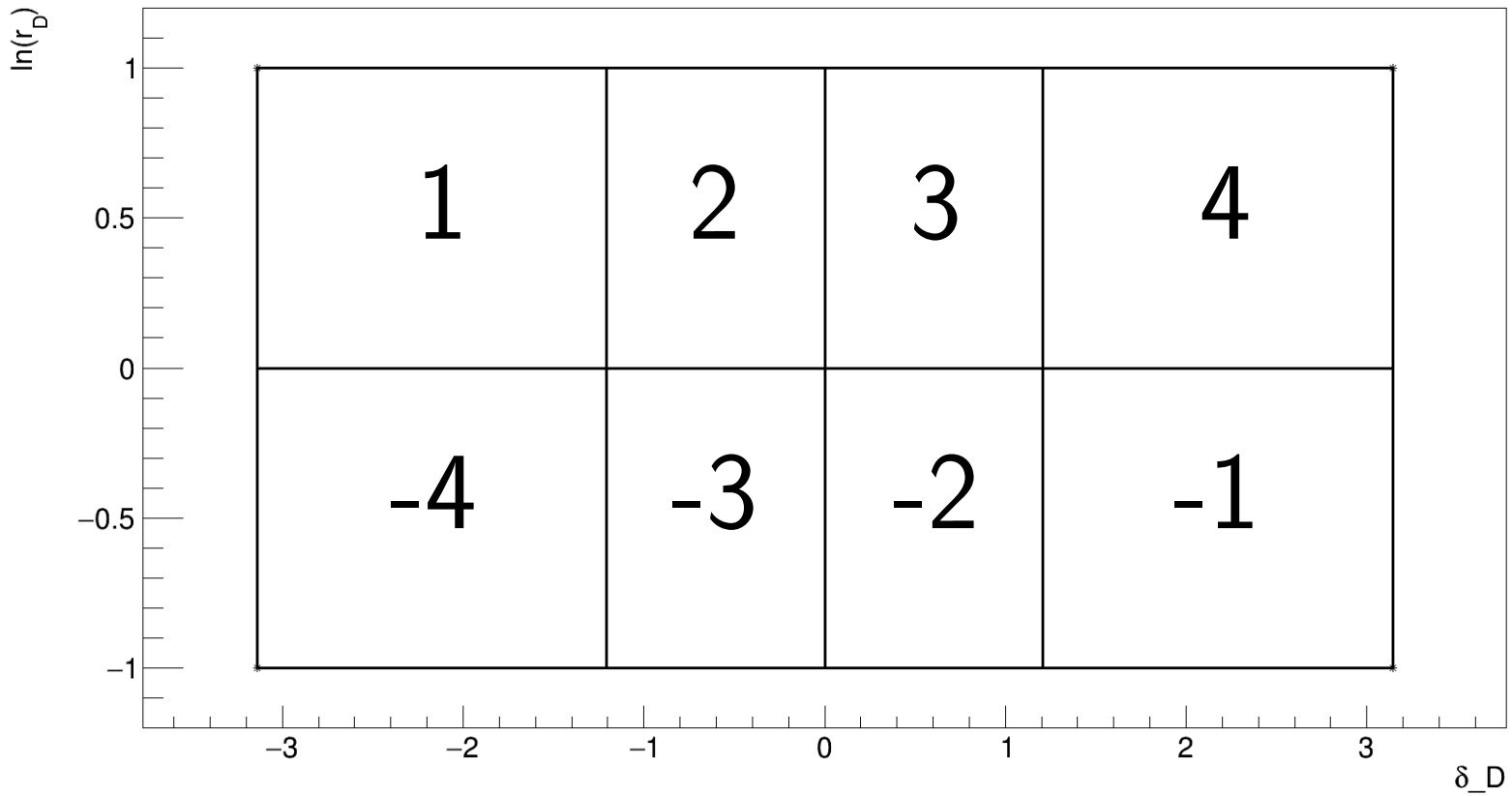
- $KK\pi\pi$ vs KK (CP even tag)
- $KK\pi\pi$ vs $K_S\pi^0$ (CP odd tag)
- $KK\pi\pi$ vs $K\pi$ (flavour tag)

Sideband background subtraction method



$$B = \frac{a_S}{a_D} Y_D + \sum_{i=A,B,C} \frac{a_S}{a_i} \left(Y_i - \frac{a_i}{a_D} Y_D \right) \quad (1)$$

$KK\pi\pi$ binning scheme



- δ_D: Strong phase
- r_D: Ratio of D^0 to $\bar{D}^0$ decay amplitude

KK double tag yield

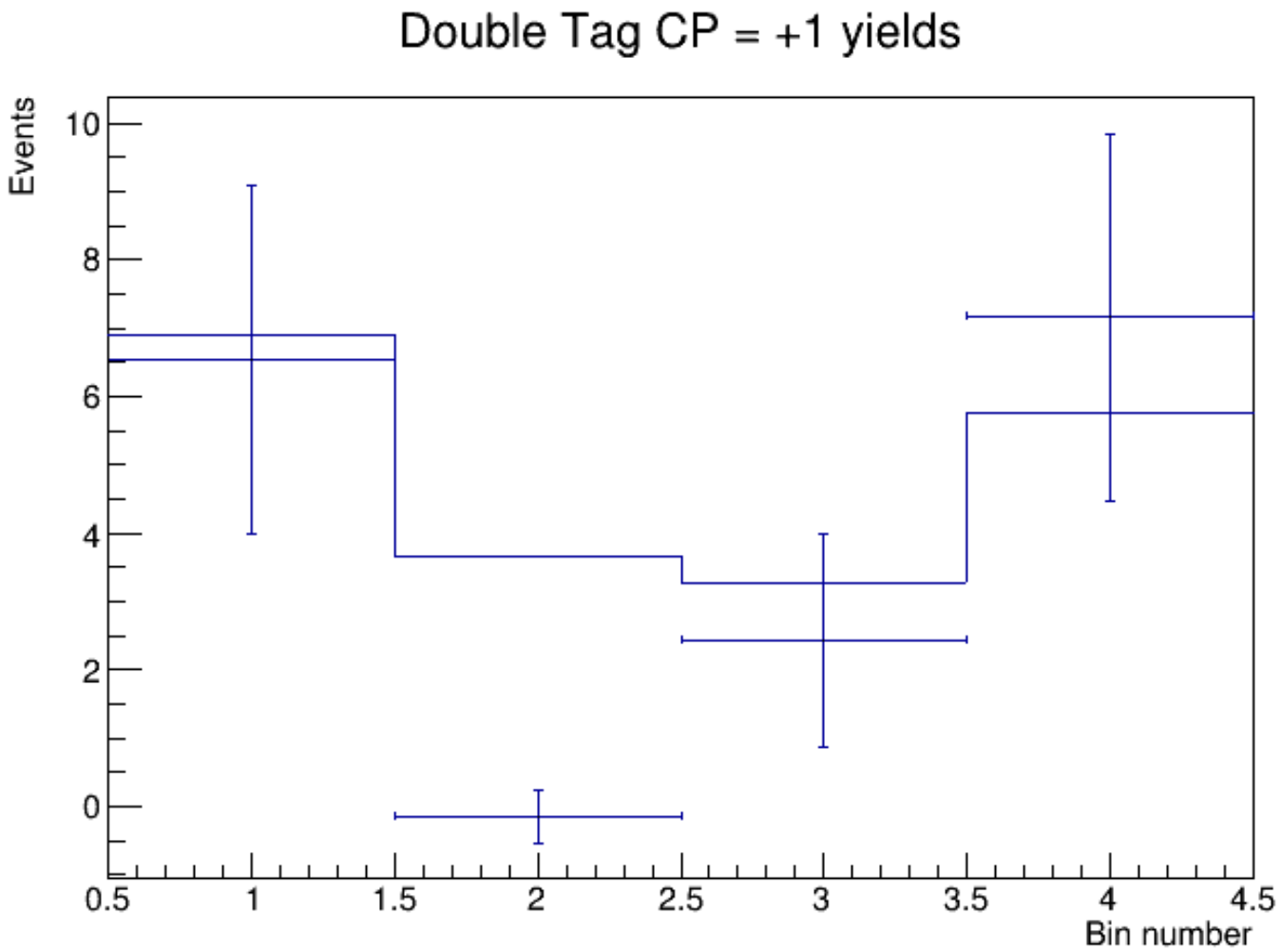


Figure 4: KK double tag yield in $KK\pi\pi$ bins

$K_S\pi^0$ double tag yield

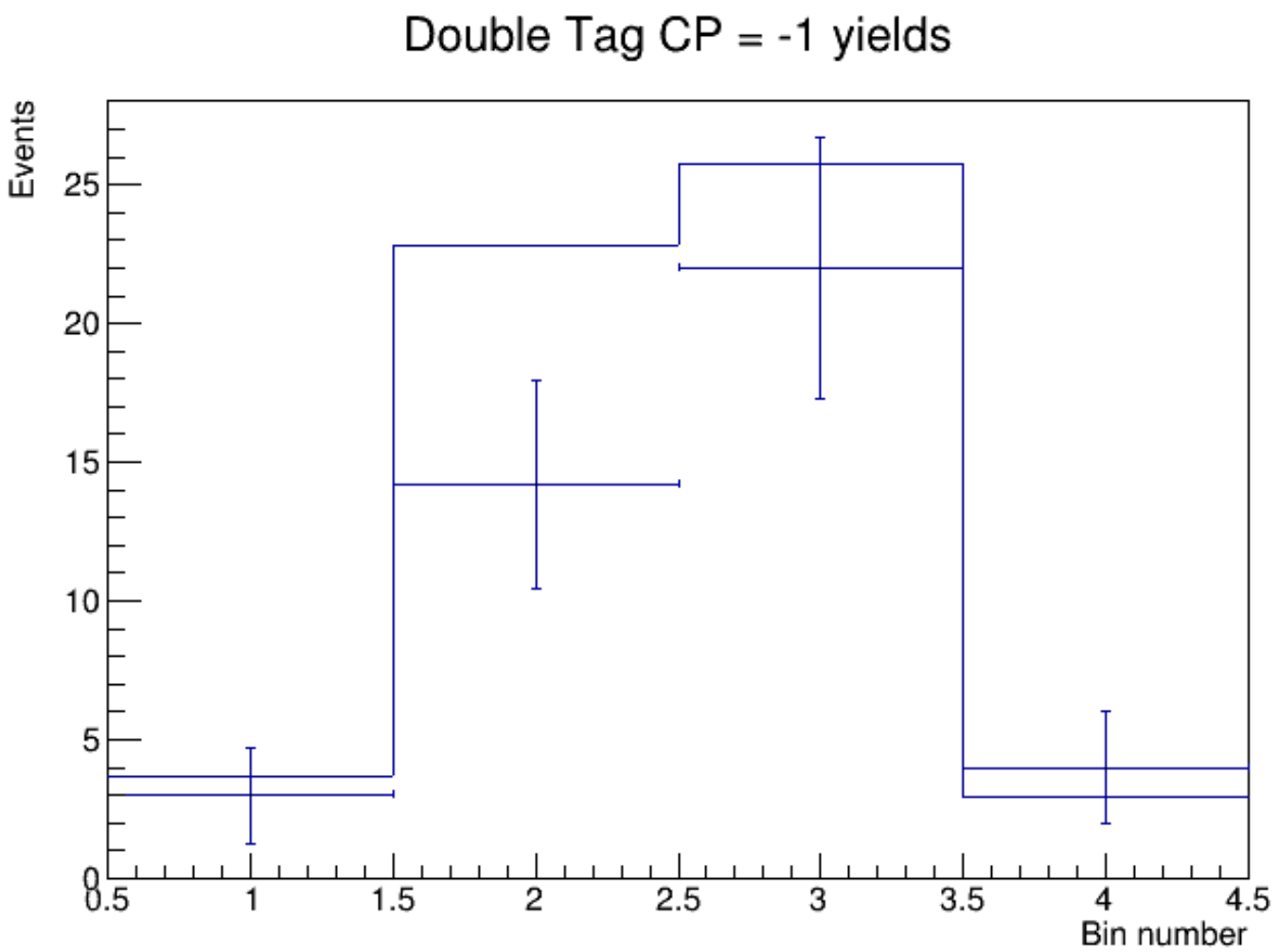


Figure 5: $K_S\pi^0$ double tag yield in $KK\pi\pi$ bins

$K\pi$ double tag yield

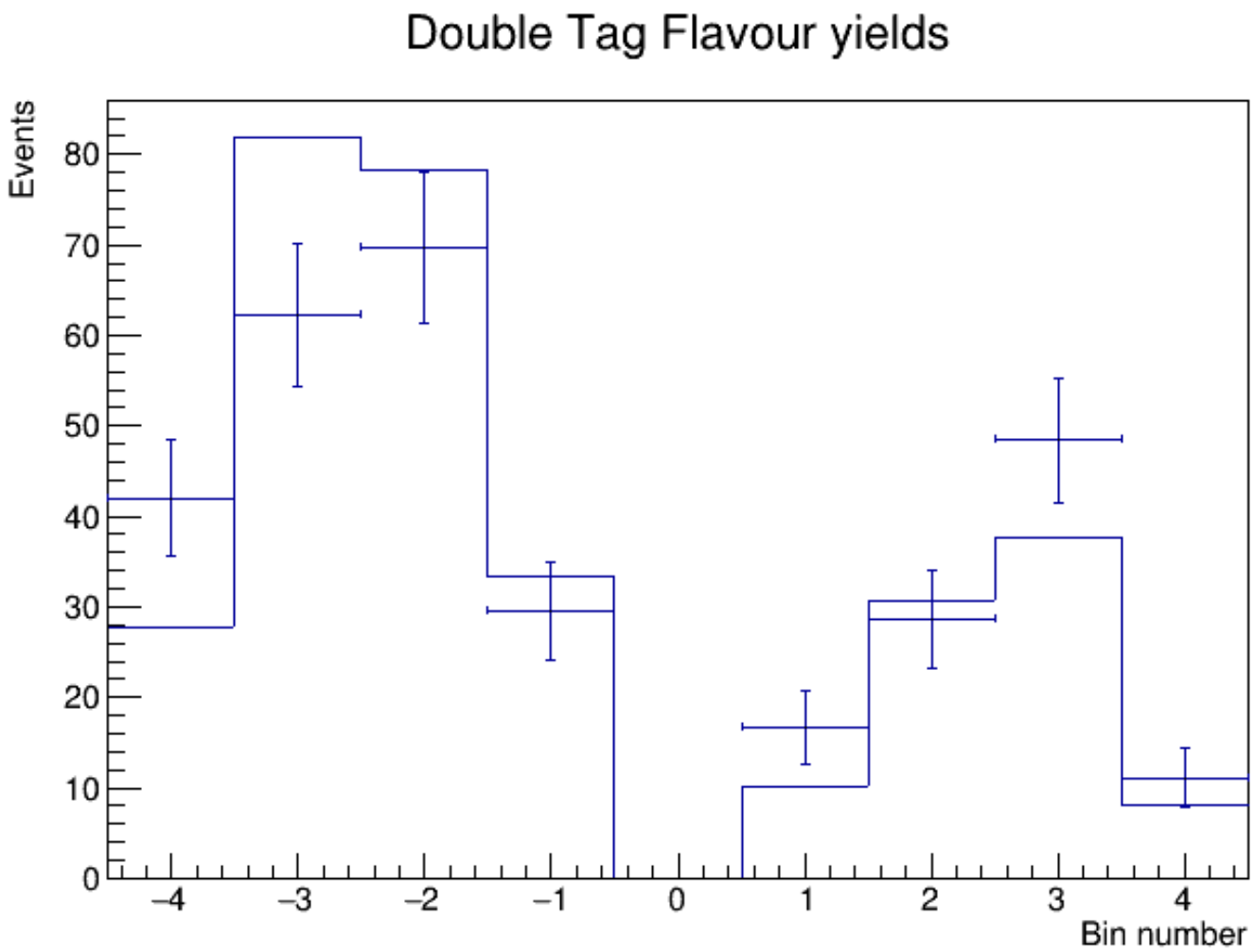


Figure 6: $K\pi$ double tag yield in $KK\pi\pi$ bins

Next steps

- Yields of other ST modes
- Yields of other DT modes