Study of $\Upsilon(1,2S) \to \Lambda\phi + X$ decay at Belle

Group meeting

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Data samples and MC simulation

$$\Upsilon(1,2S) \to \Lambda[\to p^+\pi^-]\phi[\to K^+K^-] + anything$$

Data samples

- 5 fb^{-1} data sample collected at $\Upsilon(1S)$ peak $\sqrt{s} = 9.46$ GeV.
- 89 fb^{-1} continuum data sample collected at $\sqrt{s} = 10.52$ GeV.

MC simulation

- 2×10^5 no-P$_s$ MC(PHSP MC)

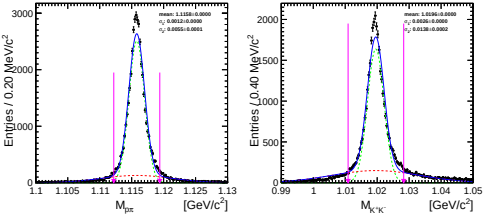
Selection Criteria

- PID selection
  - $\frac{\mathcal{L}(K^{\pm})}{\mathcal{L}(K^{\pm})+\mathcal{L}(\pi^{\pm})} > 0.9$ and $\frac{\mathcal{L}(K^{\pm})}{\mathcal{L}(K^{\pm})+\mathcal{L}(p)} > 0.9$
- Track selection
  - $dr < 0.2$ cm and $|dz| < 2.0$ cm and $|\Delta dr(K^{\pm})| < 0.2$ cm
- Λ MVA selection
  - $\mathrm{ksnbNoLam} < -0.4$ and $\mathrm{ksnbV0Like} > 0.5$
- Λ mass window
  - $|M(p\pi) - 1.1156| < 3 \times 0.0008$ GeV$/c^2$
- ϕ mass window
  - $|M(K^+K^-) - 1.0196| < 3 \times 0.0019$ GeV$/c^2$
- Veto the background from $\Xi \to \Lambda\pi$

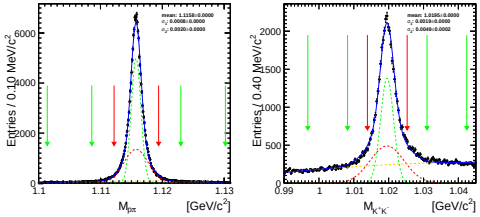
Mass window

- Signal Region
  - $|M(p\pi) - 1.1156| < 0.0008 \times 3\ \mathrm{GeV}/c^2$ and $|M(K^+K^-) - 1.0196| < 0.0019 \times 3\ \mathrm{GeV}/c^2$
- Sideband Region(2D)
  - $|M(K^+K^-)/(p\pi) - m_0 - 9\sigma| < 3\sigma$ or $|M(K^+K^-)/p\pi - m_0 + 9\sigma| < 3\sigma$

MC simulation

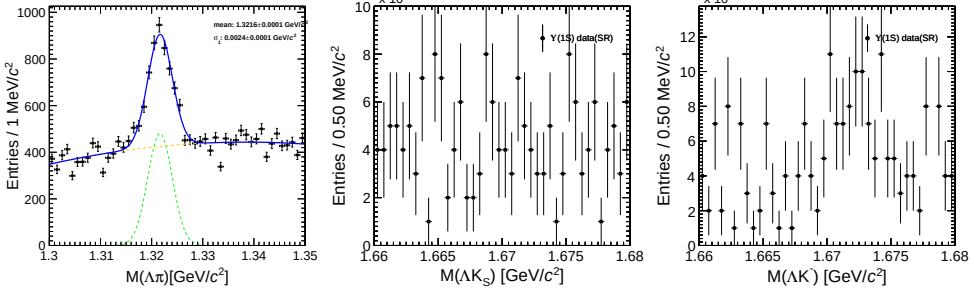


$\Upsilon(1S)$ **data**



Veto

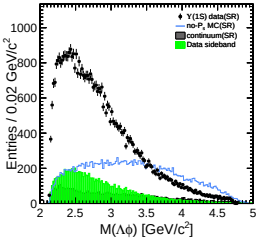
To remove the contribution from potential background processes of $\Xi \to \Lambda\pi, \Omega \to \Lambda K$ reconstruct all the pion(kaon) candidates with $\mathcal{L}_\pi(\mathcal{L}_\pi) > 0.6$

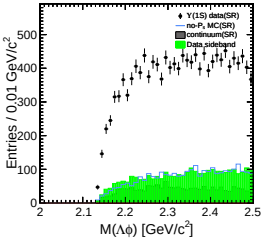


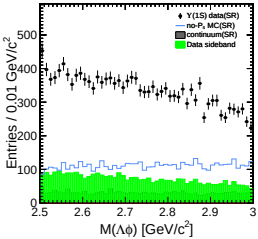
Preliminary results

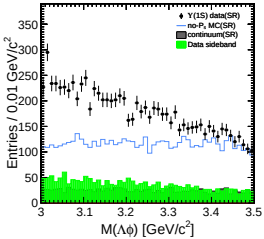
No obvious P_s signal is found in the invariant mass distribution of $\Lambda\phi$ system

$\varepsilon = 18.7\%$ assumed by PHSP MC



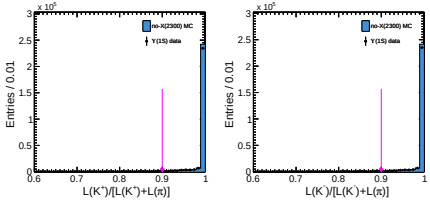




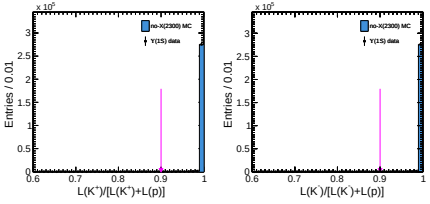


$\phi \to K^+K^-$ PID & Track selection

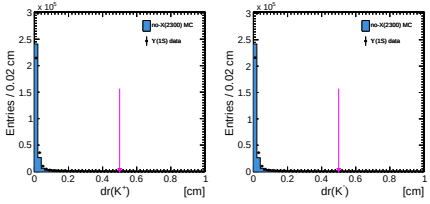
- $\frac{\mathcal{L}(K^\pm)}{\mathcal{L}(K^\pm)+\mathcal{L}(\pi^\pm)} > 0.9$



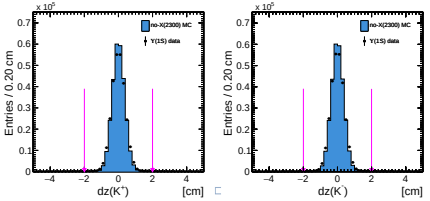
- $\frac{\mathcal{L}(K^\pm)}{\mathcal{L}(K^\pm)+\mathcal{L}(p)} > 0.9$



- $dr < 0.5$ cm

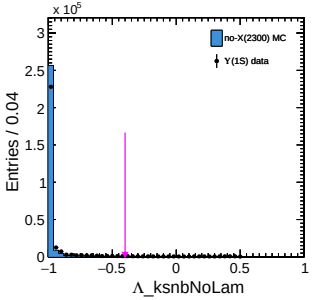


- $|dz| < 2.0$ cm



Λ MVA selection

- ksnbNoLamv < -0.4



- ksnbV0Like > 0.5