

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

Group meeting

Wang Zhang, Shiming Zou

April 17th, 2026

① Data samples and MC simulation

② Selection Criteria

③ Results

Preliminary Selection

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

Data samples

- **A 5 fb data sample collected at $\Upsilon(1S)$ peak $\sqrt{s} = 9.46$ GeV.**
- **A 25 fb data sample collected at $\Upsilon(2S)$ peak $\sqrt{s} = 10.02$ GeV.(to be added)**

MC simulation

- 2×10^5 **signalMC(assuming X(2300))**
- 2×10^5 **no- P_s MC**

- ① Data samples and MC simulation
- ② Selection Criteria**
- ③ Results

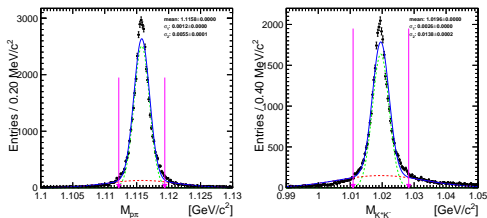
Selection Criteria

- 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
 - $\text{ksnbNoLamv} < -0.4$ and $\text{ksnbV0Like} > 0.5$
- Λ mass window
 - $|M(p\pi) - 1.1156| < 3 \times 0.0008 \text{ GeV}/c^2$
- ϕ mass window
 - $|M(K^+K^-) - 1.0196| < 3 \times 0.0019 \text{ GeV}/c^2$
- **scaled momentum(xp) of $xp_{\Lambda\phi} > 0.68$**

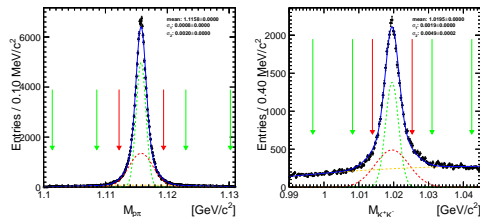
Mass window

- Signal Region
 - $|M(p\pi) - 1.1156| < 0.0008 \times 3 \text{ GeV}/c^2$ and $|M(K^+ K^-) - 1.0196| < 0.0019 \times 3 \text{ GeV}/c^2$
- 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

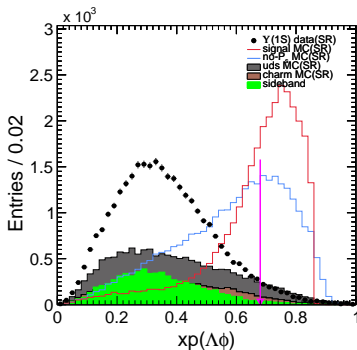
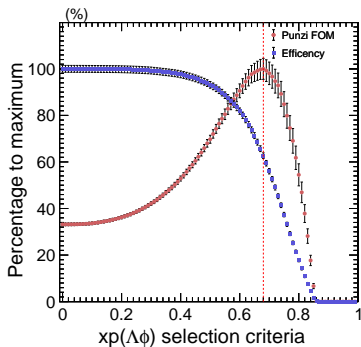


Scaled momentum selection

- x_p definition

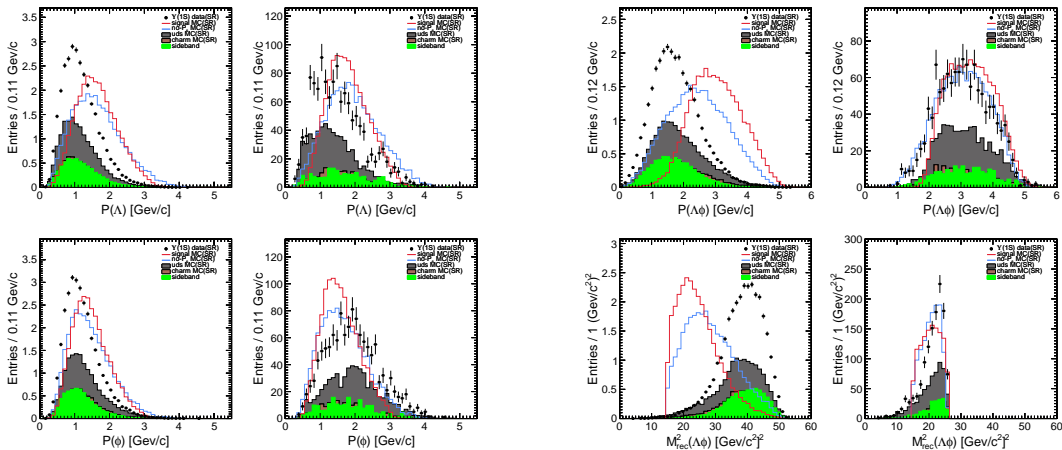
$$x_p = p_{\Lambda\phi}^* / \sqrt{E_{cm}^2 - M_{\Lambda\phi}^2}$$

the momentum of the particle in the CMS as a fraction of its maximum available momentum in the collision



Momentum and MRecoil distribution

left pads show without xp cut, right pad show applied



- ① Data samples and MC simulation
- ② Selection Criteria
- ③ Results**

Preliminary results

potential P_s signal may be find in the invariant mass distribution of $\Lambda\phi$ system ?

