

Absolute branching fractions for Λ_c^+ decays at BESII

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The importance of Λ_c^+

- Since the first discovery of Λ_c^+ in 1979, progress of charmed baryons is relatively slow compared to charmed meson.
- The lightest charmed baryon, is the cornerstone of charmed baryons spectroscopy.
- Λ_c^+ decays receive sizable non-factorizable contributions from W-emission and W-exchange diagrams.
- Provides an ideal laboratory to understand the interplay of the weak and strong interaction, and is complementary to







Semi-leptonic decays

A good test to non-perturbative model and LQCD calculation. $(c \rightarrow s \ell^+ \mathcal{V}_{\ell})$ **Double tag,** $U_{miss} = E_{miss} - |\vec{p}_{miss}|$





charmed mesons.

• Provides essential input for studying b-flavored baryon decays involving a Λ_c in the final state.

BESIII experiment at BEPCII



2004: start BEPCII construction 2008: test run of BEPCII 2009-now: BESIII data taking Beam energy: 1.0-2.3GeV Design Luminosity: $1 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1} @\sqrt{\text{s}} = 3.770 \text{GeV}$ (achieved in April, 2016)

○ The precision of absolute BFs are improved significantly) BF for $\Lambda_c^+ \rightarrow pK^-\pi^+$ is consistent with PDG value, but lower than Belle's value [2] with a significance of about 2σ \bigcirc Improved absolute BF of pK⁻ π^+ is key to calibrate other decays

 $\Lambda_{c}^{+} \rightarrow n K_{S}^{0} \pi^{+}$

D A precise test on the isospin symmetry and final state interaction Double tag, two-dimensional unbinned simultaneous fit

 $M_{miss}^2 = E_{miss}^2 - |\vec{p}_{miss}|^2$

 $\bigcirc B(\Lambda_c^+ \to \Lambda e^+ \nu_e) = (3.63 \pm 0.38 \pm 0.20))\%$ $\bigcirc B(\Lambda_c^+ \to \Lambda \mu^+ \nu_{\mu}) = (3.49 \pm 0.46 \pm 0.27)\%$ $\bigcirc B(\Lambda_c^+ \rightarrow \Lambda \mu^+ \nu_{\mu}) / B(\Lambda_c^+ \rightarrow \Lambda e^+ \nu_e) = (0.96 \pm 0.16 \pm 0.04)\%$ ○ The first absolute BFs measurements ○ The ratio is compatible with unity, and helpful to understand semi-leptonic decay mechanism

Summary





Analysis technique



-Tag the charmed baryon flavor via hadronic decays with large branching

B€SⅢ



 \bigcirc Preliminary result: B($\Lambda_c^+ \rightarrow nK_S^0\pi^+$)= (1.82±0.23±0.11)% \bigcirc First observation of Λ_c^+ decay with final states involving the neutron

$\Lambda_{c}^{+} \rightarrow pK^{+}K^{-}/p\pi^{+}\pi^{-}$

 \Box Singly Cabbibo-suppressed decays, shed light on dynamics of Λ_c^+ decays $\Box \Lambda_c^+ \rightarrow p\phi$ is particular interest because of only internal W-emission diagram \Box Single tag, relative BFs to the CF decay $\Lambda_c^+ \rightarrow p K^- \pi^+$ Submitted to PRL



have published.

More potentials

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○ A large data set may provide a unique opportunity to improve our knowledge on Λ_c^+ decays. PWA analysis on Cabbibo-favored decays and studies of the modes involving the neutron. \bigcirc More semi-leptonic modes like $\Lambda_c^+ \rightarrow pK^-e^+\nu_e$ can be studied at BESIII. Measurements of the weak decay asymmetry parameters of Λ_c^+ .

Reference

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