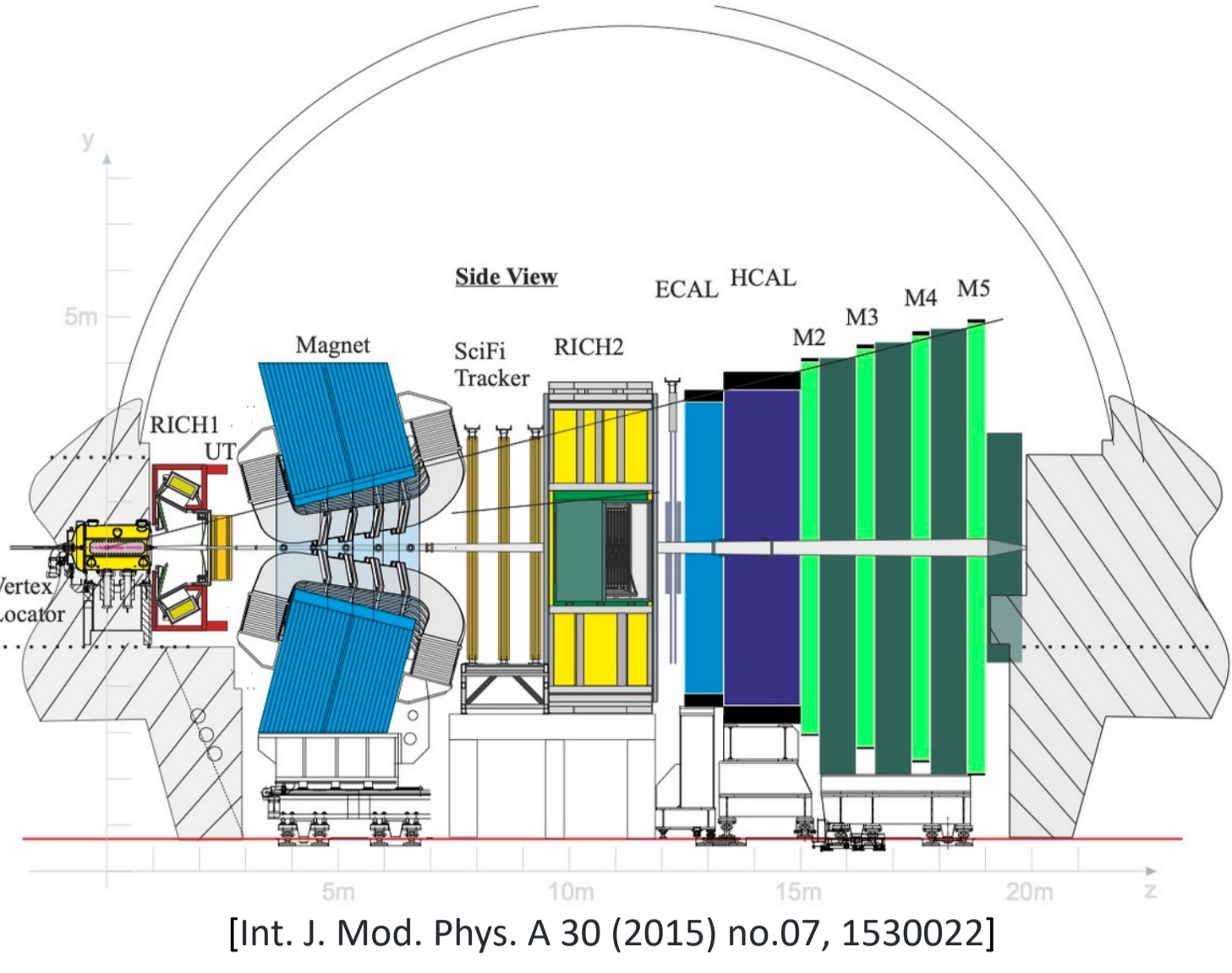


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LHCb Experiment



- Optimized for high-energy production of b- and c-hadrons, predominantly produced in the same forward or backward cone:
- Single-arm spectrometer.
- Forward angular coverage: 15 mrad to 300 (250) mrad in the bending (non-bending) plane.

Why we Search for Doubly Charmed Baryon Ξ_{cc}

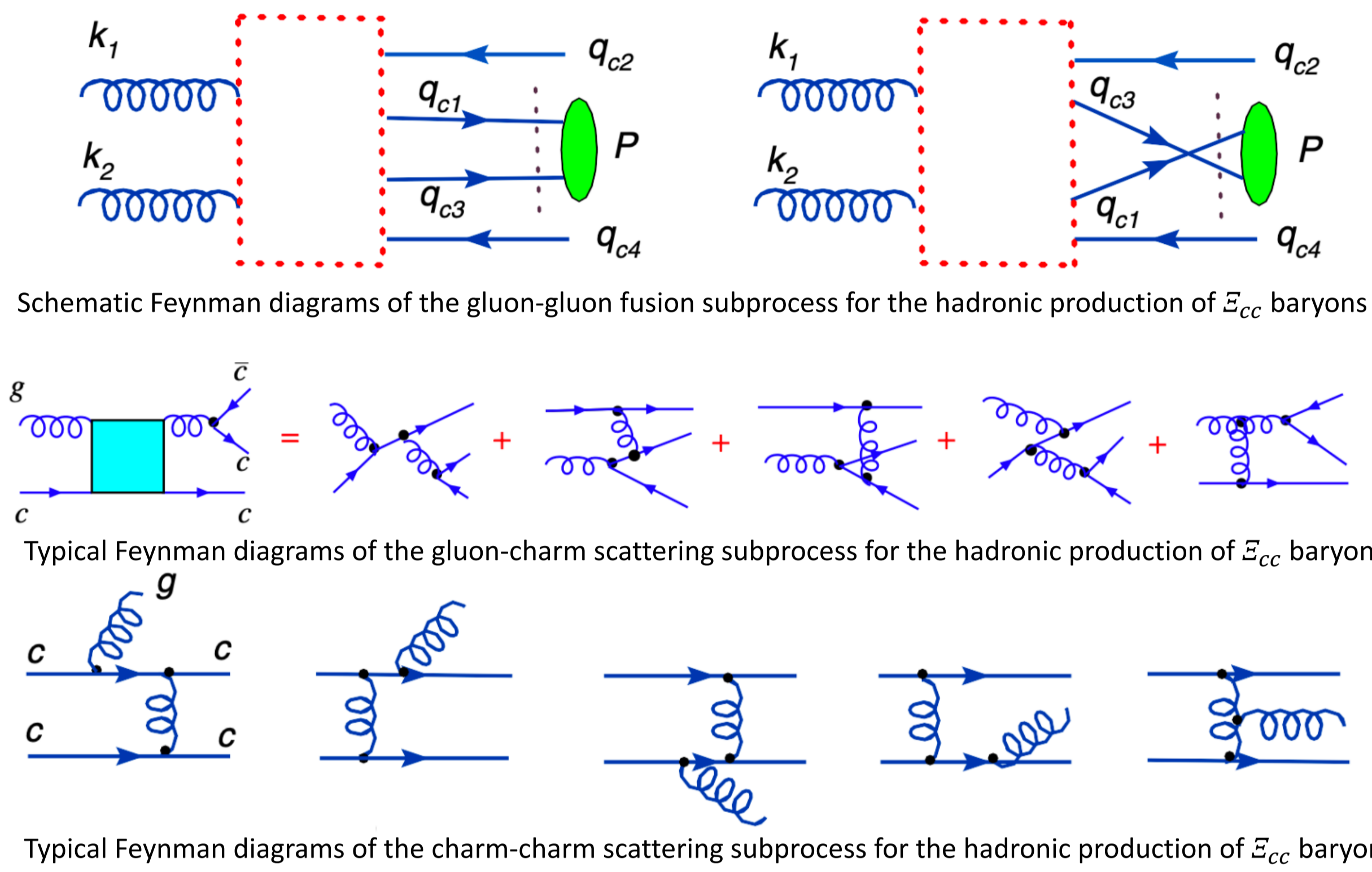
Quark Model $u, d, s \rightarrow SU(3)$ $J^P = \frac{1}{2}^+$
 $c \rightarrow SU(4)$ $J^P = \frac{3}{2}^+$

Doubly charmed baryons resemble hydrogen-like atoms.

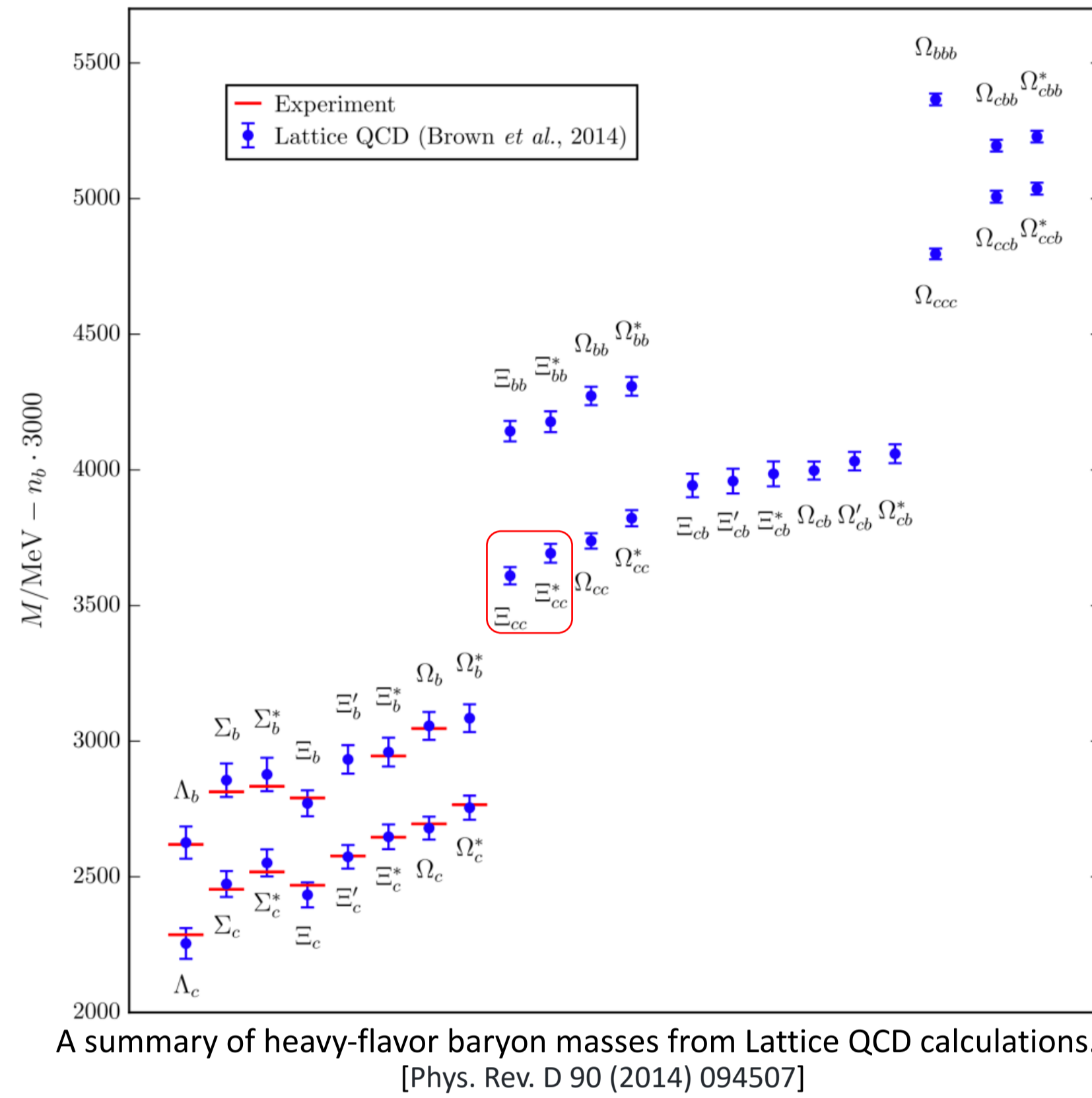
Simplify calculations and allow predictions about their characteristics.

The $J^P = \frac{3}{2}^+$ (left) $J^P = \frac{1}{2}^+$ (right) flavour SU(4) ground-state charmed baryons. [Prog. Theor. Exp. Phys. 8 (2020) 083C01]

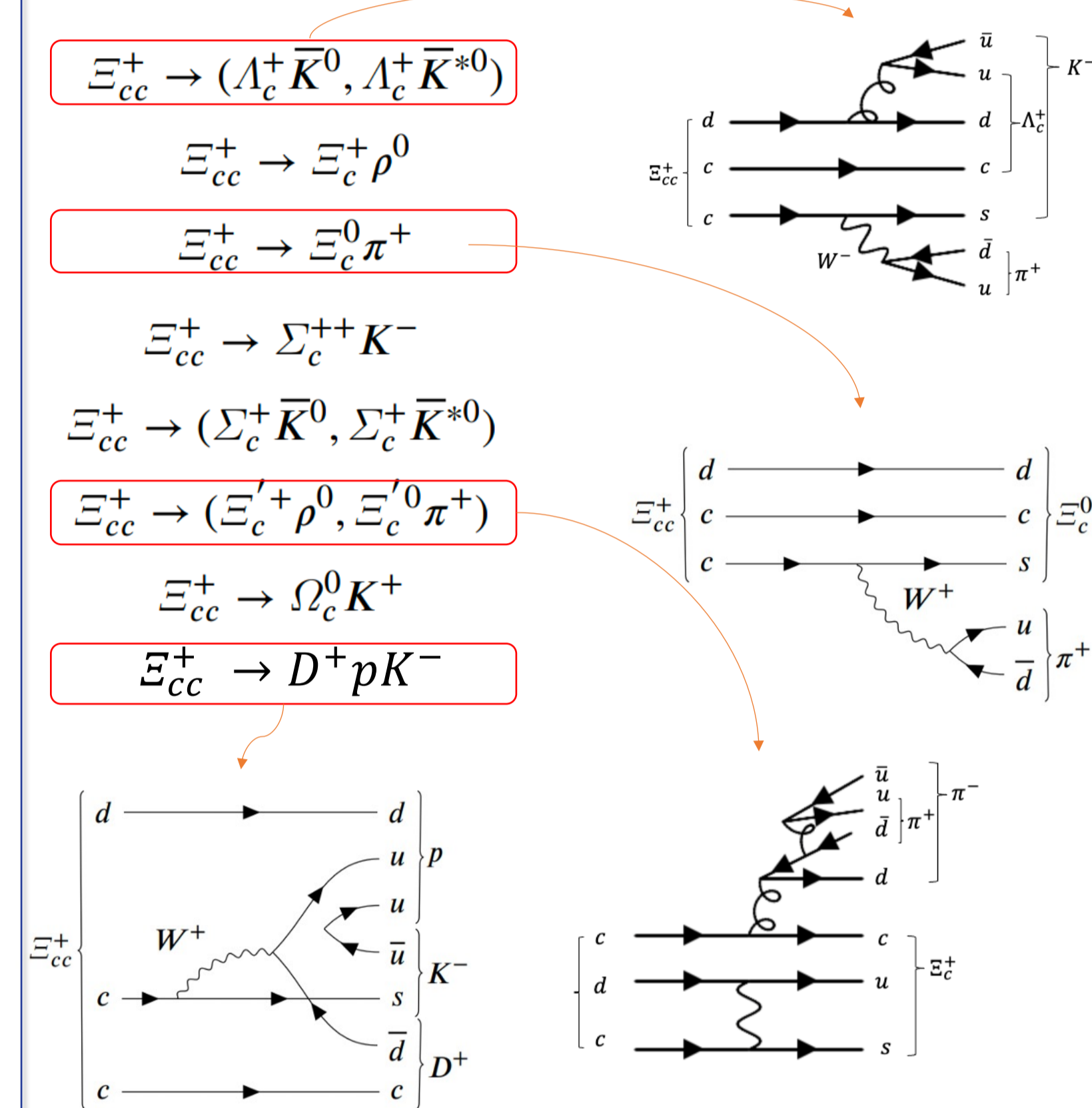
Ξ_{cc} Production in pp Collision



Theoretical Predictions for $m(\Xi_{cc})$



How to Search Ξ_{cc}^+



Measurement of Ξ_{cc}^{++}

Cross Section

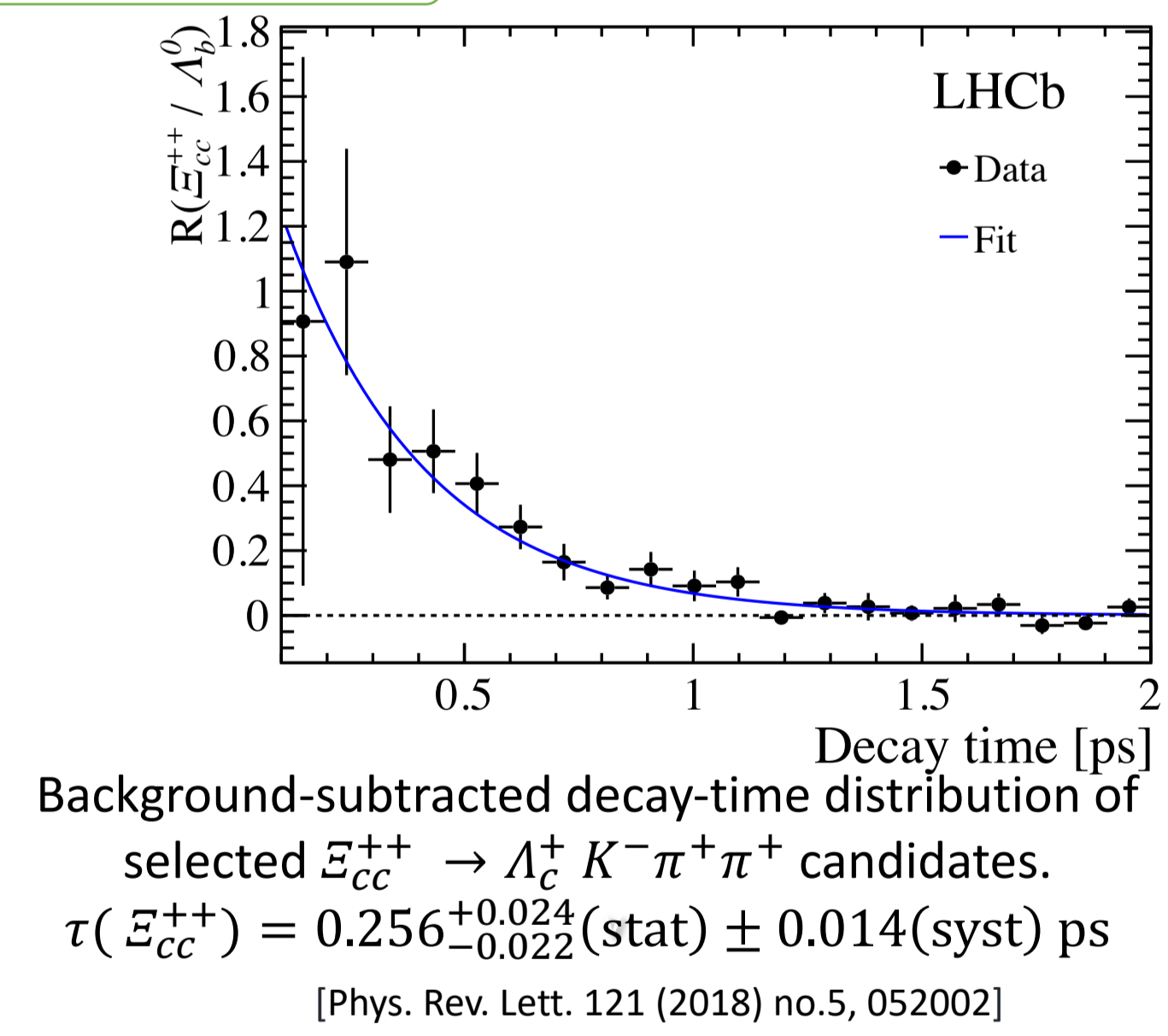
Cross section of Ξ_{cc}^{++} in LHCb experiment measured by $\Xi_{cc}^{++} \rightarrow \Lambda_c^+ K^- \pi^+ \pi^+$ decay mode:

$$R \equiv \frac{\sigma(\Xi_{cc}^{++}) \times \mathcal{B}(\Xi_{cc}^{++} \rightarrow \Lambda_c^+ K^- \pi^+ \pi^+)}{\sigma(\Lambda_c^+)}$$

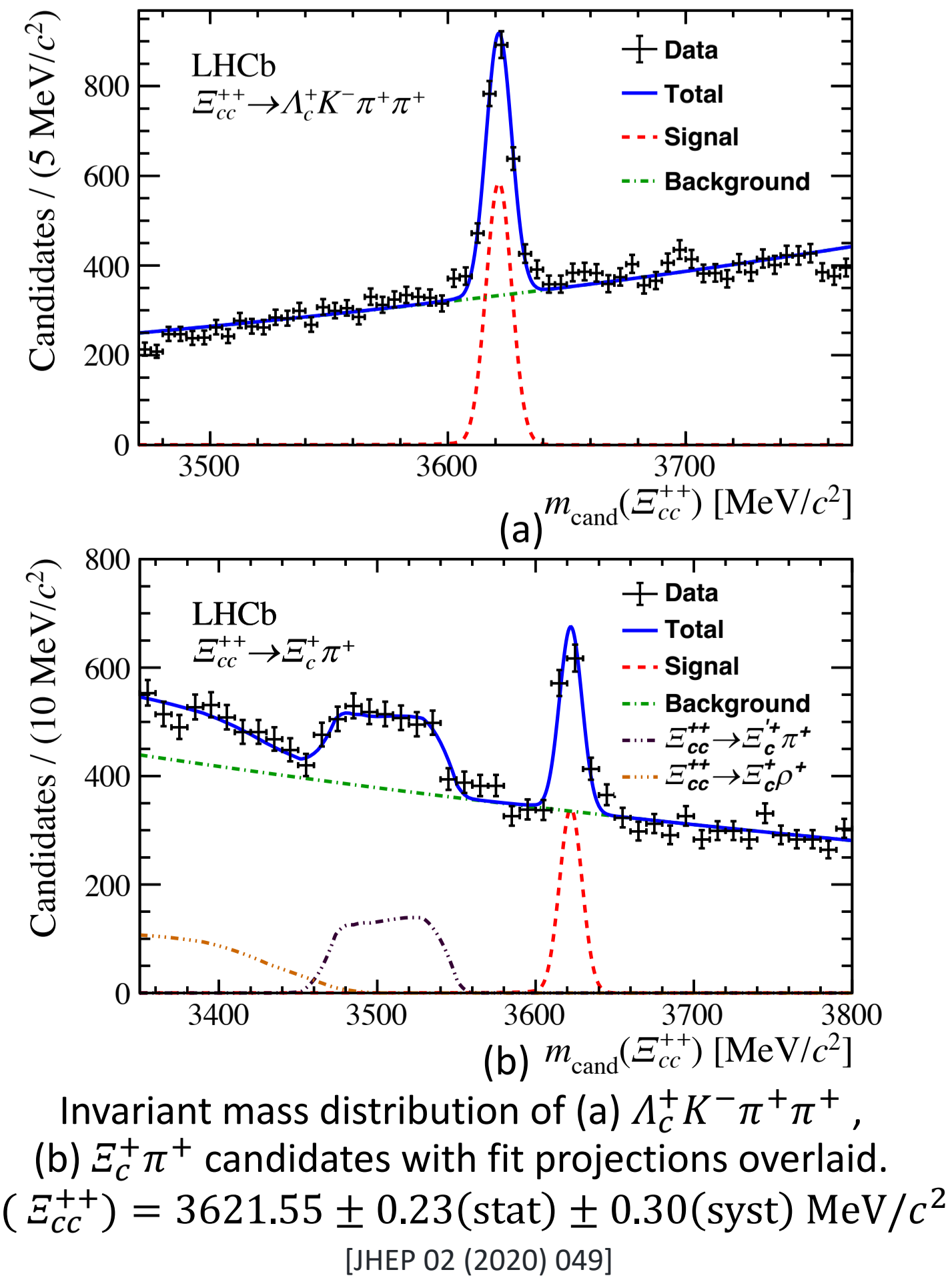
$$= (2.22 \pm 0.27 \pm 0.29) \times 10^{-4}$$

[Chin. Phys. C 44 (2020) 022001]

Lifetime



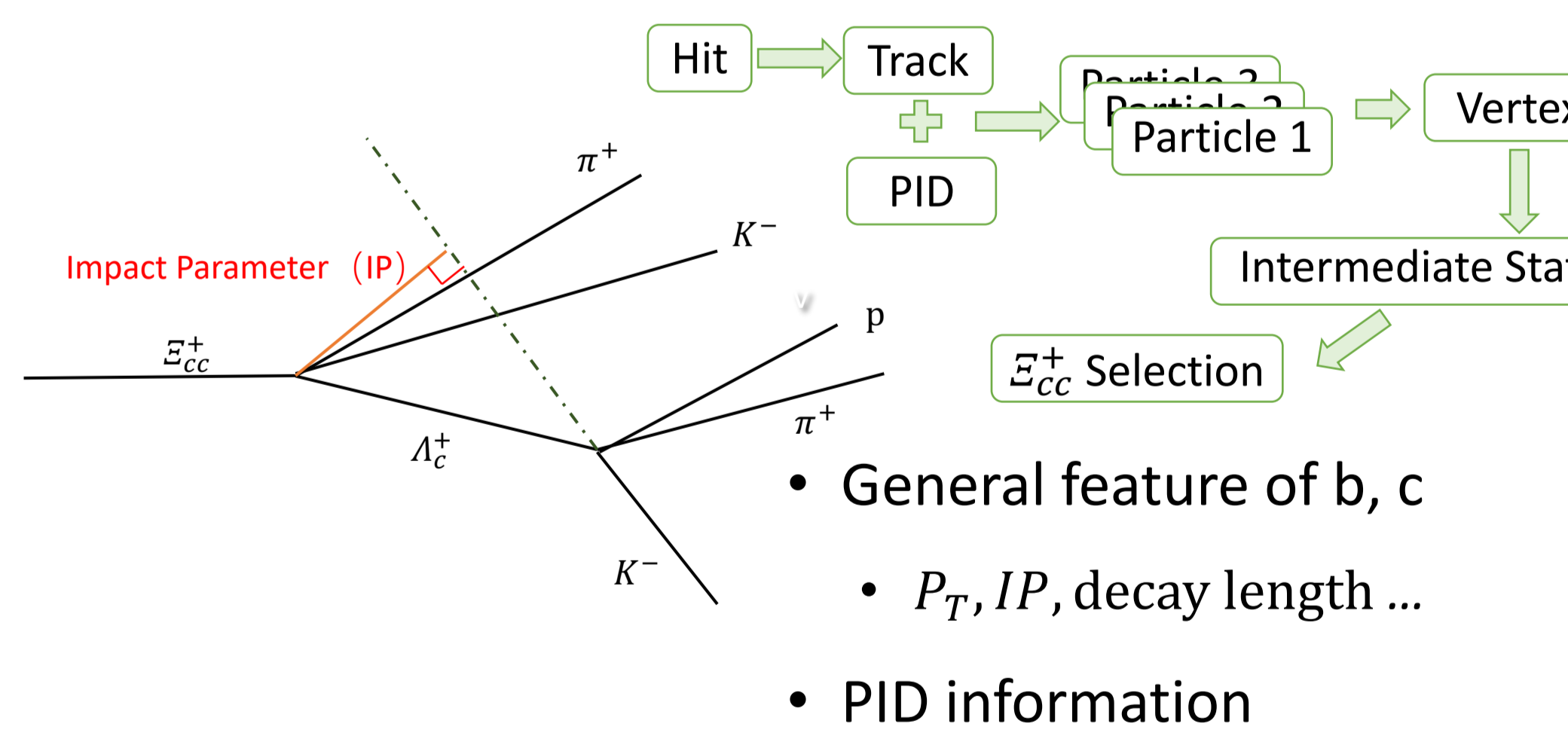
Mass



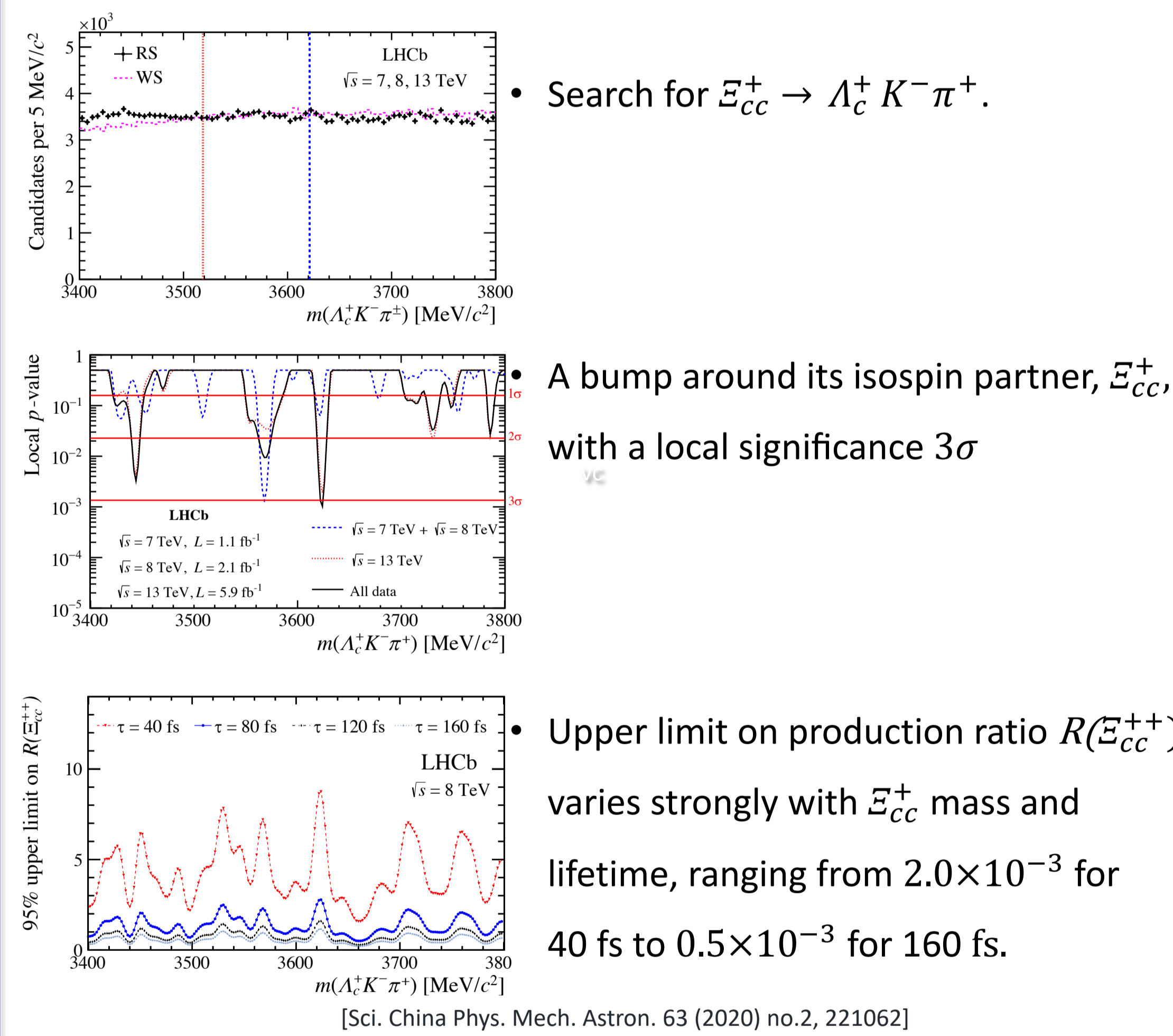
Prediction of Ξ_{cc}^+ Lifetime

- Decay rate \propto Invariant amplitude²
 - $\tau = \frac{1}{\Gamma} \xrightarrow{\text{influence}}$ Width of invariant mass distribution.
 - Pauli interference effect & W-exchange effect $\rightarrow \tau(\Xi_{cc}^+) \approx \frac{1}{3} \tau(\Xi_{cc}^{++})$
- [Nucl. Phys. B 248 (1984) 261]

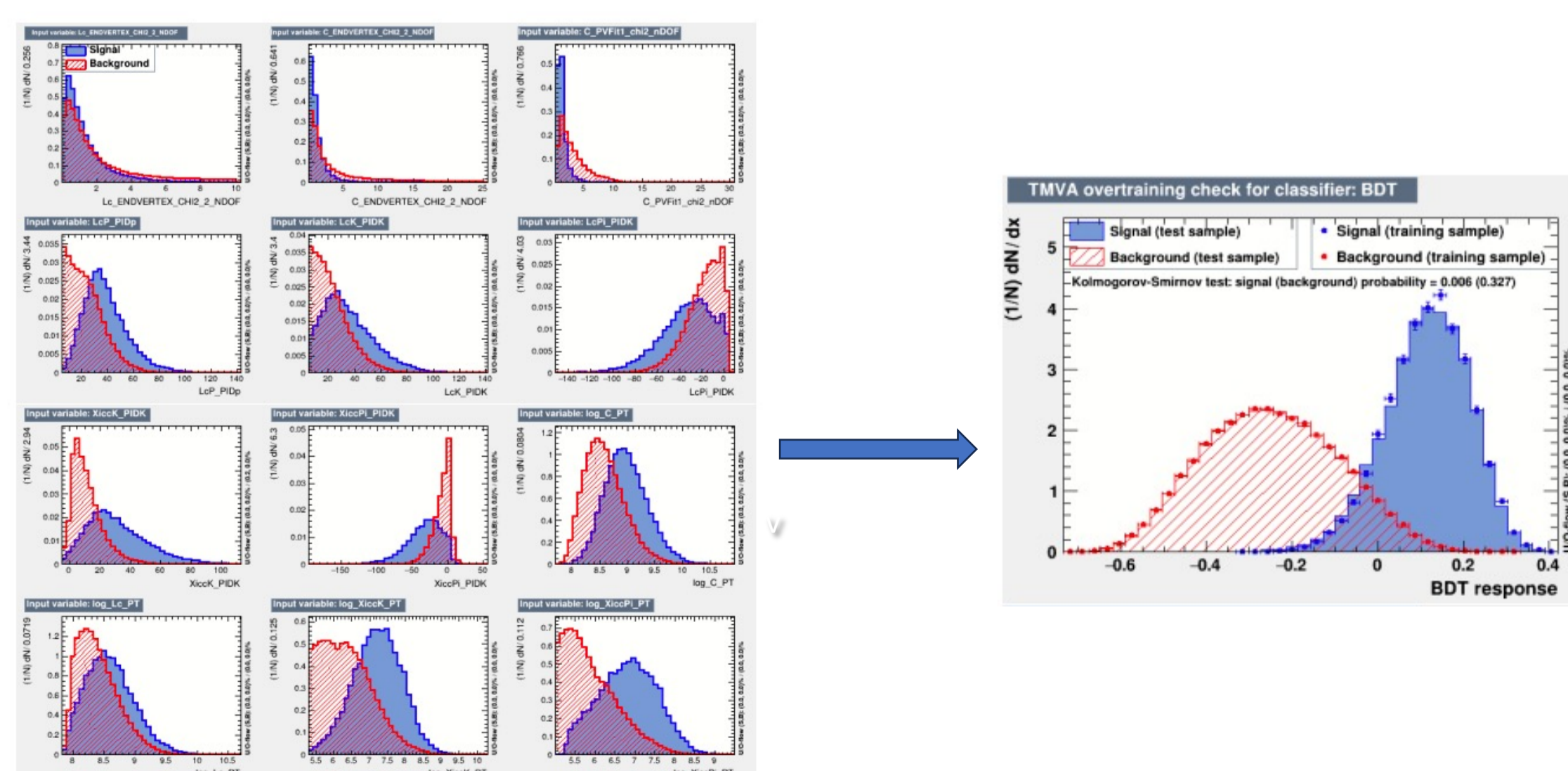
Event Selection Strategy



Ξ_{cc}^+ Search, Present status



Multivariate Analysis



Future Plan

Data in Run 3 & Improve Cut for Selection