Feasibility study of the measurement of absolute branching fractions of the Λ_c baryon

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Brief Intro

- Motivation:
  - All decays of the heavy baryons Λ ... are presently affected by a large ... of 22% in the decay of $\Lambda_c^+ \to p K^- \pi^+$.
  - Investigate whether ... hain of the $\Lambda_c(2595)^+$ (an excited state ... provide a tag that is precise enou ... a low enough background to count th ... ber of Λ_c^+ baryons in the data sam ...
  - Es ... e precision that can be obtained in the LHC ... periment and identify possible backgrounds.

My work is doing Monte Carlo simulation to find an effective way to select Λ_c.

A Little Theory

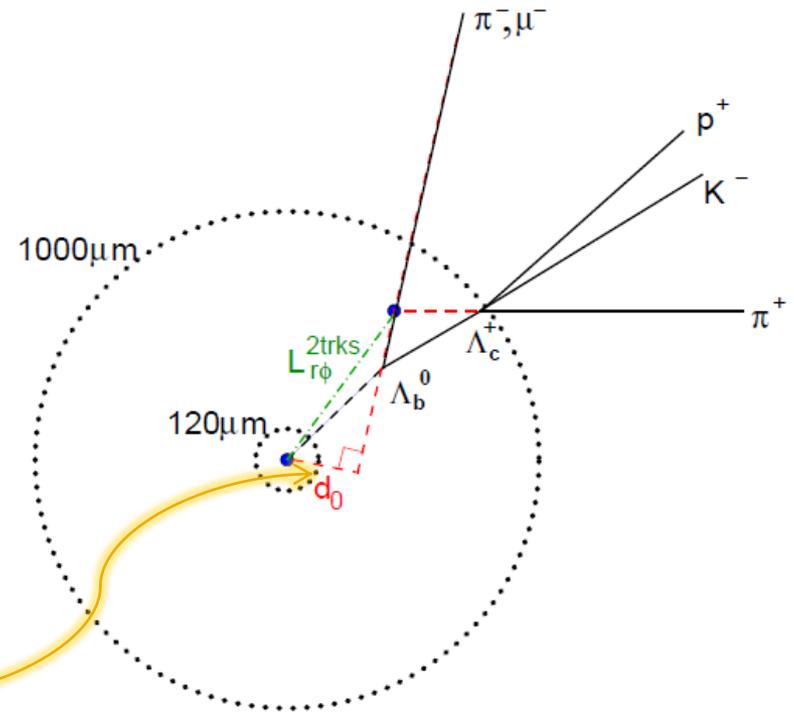Decay chain:

$\Lambda_b^0 \to \Lambda_c^+ \mu^- \bar{\nu}_\mu$

M=2455

$\Lambda_c (2595)^+ \to \Sigma_c^{0,++} \pi^{+,-}$

$\Sigma_c^0 \to \Lambda_c^+ \pi^-$

$\Sigma_c^{++} \to \Lambda_c^+ \pi^+$

M=2286

Impact Parameter (IP)

r-φ view of the decay (from CDF Collaboration)

Three Stages

Fast MC
- Python
- Raw random number to simulate

Complete MC
- Still Python
- Using events generated by Pythia
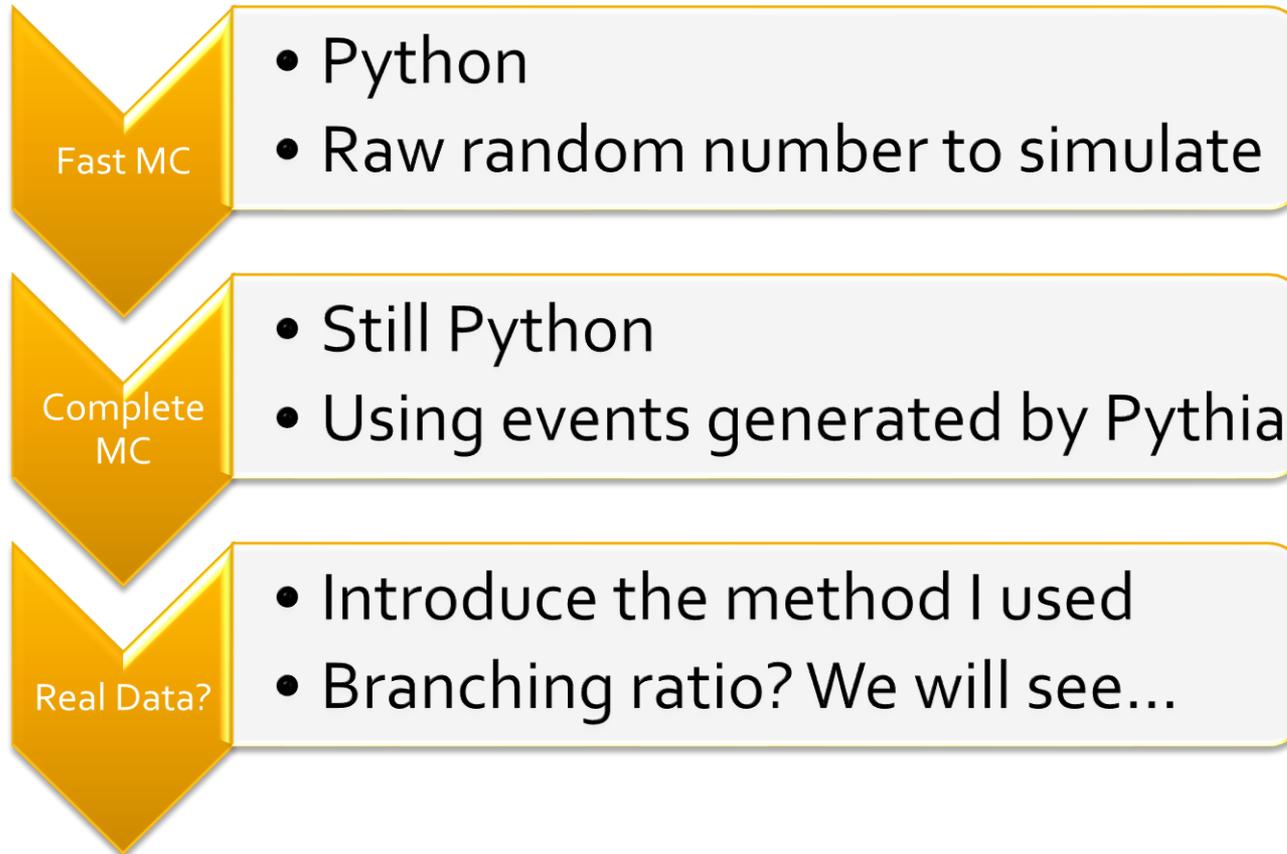
- Almost all information of events are accessive
- Depend on how much cheating

Real Data?
- Introduce the method I used
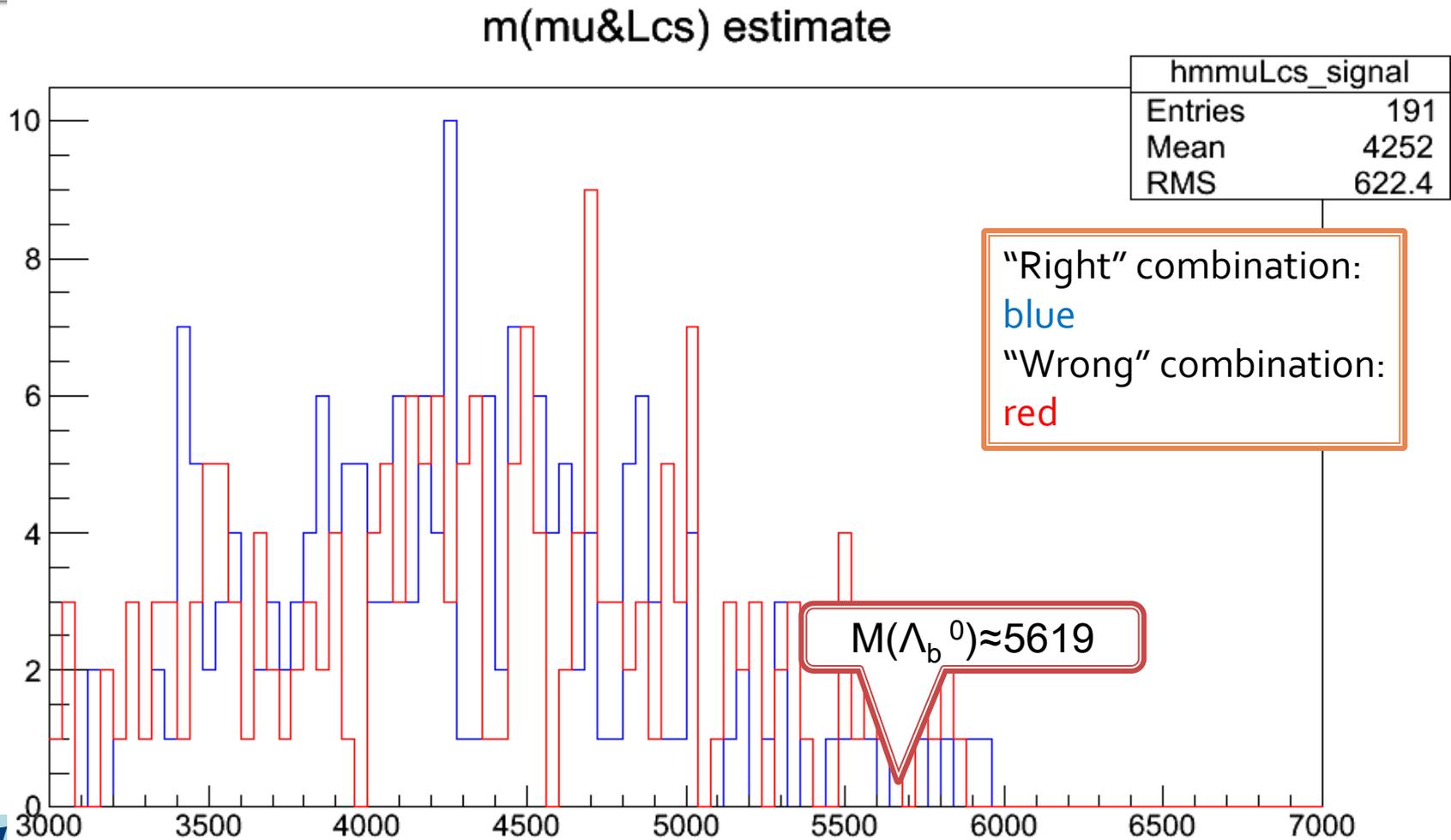- Branching ratio? We will see...

Stage One (finished)
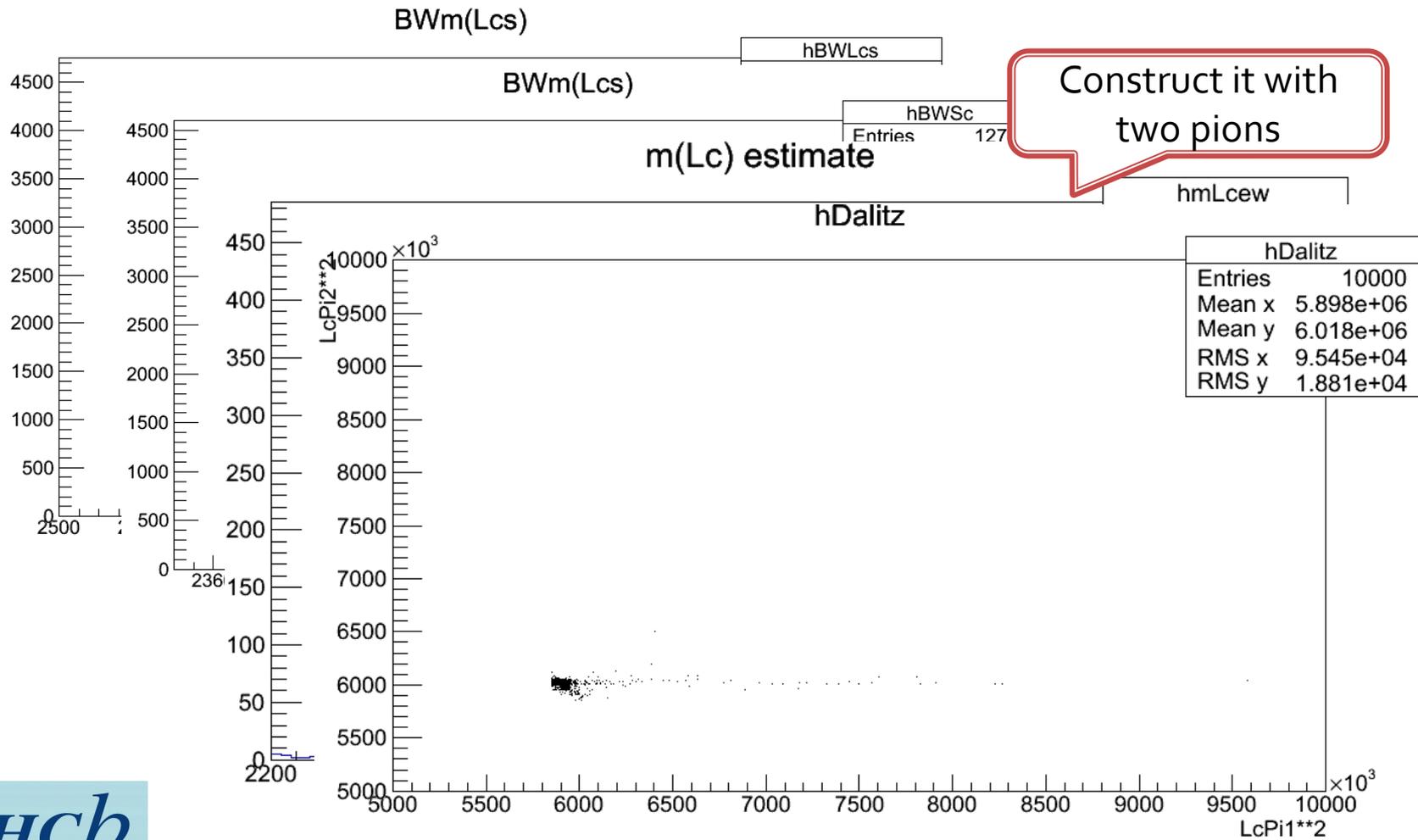
Progress at Stage Two

- **Several improvements** (use generated events):
    - Less "cheating": visible quantity (e.g. Impact parameter (IP))
    - Pointing value:

      $<primvtx \rightarrow secondvtx, p(\mu \Lambda_c^+{}_{estimated})>$
    - Consider more background (e.g. muon + prompt pions which have IP=0)
    - And more potential physical quantity to make it clean
- **Problem:**
    - How to distinguish two pions? Cannot only rely on Pt and pointing value
    - Better way to select muons
    - Candidates are rare → time consuming

Progress at Stage Two

m(mu&Lcs) estimate

hmmuLcs_signal	
Entries	191
Mean	4252
RMS	622.4

"Right" combination: blue
"Wrong" combination: red

$M(\Lambda_b^0) \approx 5619$

Enjoy