

MOTIVATION

Search for seven Λ_b^0/Ξ_b^0 charmless decay modes, proceeding through **tree** $b \rightarrow u$ and **penguin** $b \rightarrow s, d$ quark transitions.

$\Lambda_b \rightarrow p\pi\pi\pi$ - $\Lambda_b \rightarrow pK\pi\pi$
 $\Lambda_b \rightarrow pKK\pi$ - $\Lambda_b \rightarrow pKKK$
 $\Xi_b \rightarrow pK\pi\pi$ - $\Xi_b \rightarrow pK\pi K$
 $\Xi_b \rightarrow pKKK$

MEASUREMENTS

Aim to measure **CP-asymmetries** by comparing charmless decays to $b \rightarrow c$ transitions in order to subtract out **b-quark production** and charged particle **detection asymmetries**.

$\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-$ - $\Xi_b^0 \rightarrow \Xi_c^+ \pi^-$

Branching fractions are also determined.

METHOD

Simultaneous fit of the five selected spectra and control channels, split in proton and antiproton, 2011 and 2012, all built in a mutually exclusive way.

Charmless signal regions as well as the measured yields were **hidden** while developing the **fit model**.

Simultaneous fit

- The particle identification selection is designed so that a candidate appears in **one spectrum only**.
- Signal events with **a pion or a kaon misidentified** will appear in a companion spectrum. This will be referred as **cross-feed background**.
- **Cross-feed yields** are determined from the yield measured in the original spectrum and the particle **(mis)identification probabilities** measured in data control samples.
- The model is fit **simultaneously** to the five signal spectra and control channels.
- Several parameters are **shared** between spectra, reducing systematic uncertainties.

Background contributions and fit model

- There are at least **five main categories of backgrounds** identified.
 - Peaking background, partially reconstructed background, decays of B mesons, cross-feed background and combinatorial background.

Partially reconstructed

- 5-body decays where one track is not reconstructed.
- Modelled with an ARGUS function convolved with a Gaussian.

Decays of B mesons (4 and 5-body)

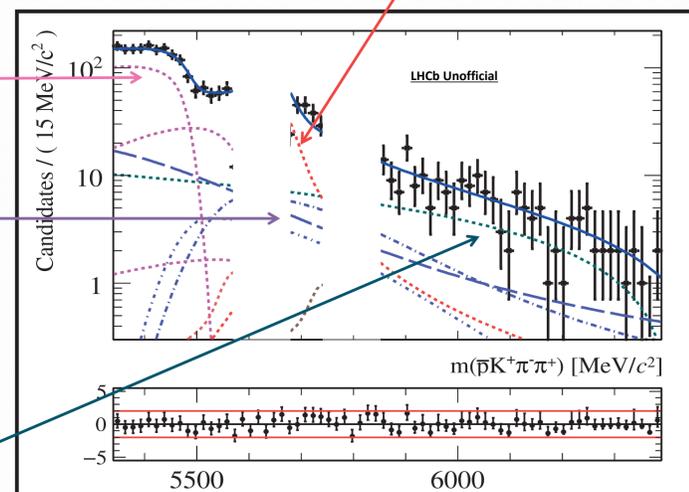
- 4-body decays coming from B^0 or B_s^0 with a K or π misidentified as a proton.
- Modelled with a Cruijff function

Combinatorial background

- Combination of several tracks unrelated to the signal.
- Modelled with a pynomial function.

Cross-feed background

- True signal events may appear as a cross-feed in other spectrum if a track is misidentified.
- Modelled with a double CrystalBall function.



Combined invariant mass spectra

- The simultaneous fit technology allows **CP-asymmetry** measurements as well as **branching fraction** measurements of the seven modes of interest.
- The latter is made by summing the proton and anti-proton individual PDFs for each component **while keeping blind** the charge-dependent spectra. The sum of their yields is unveiled after the fit model has been developed.
- **Branching fraction** relative to the charmed mode

$\Lambda_b^0 \rightarrow \Lambda_c^+ (\rightarrow pK^- \pi^+) \pi^-$

to be determined for the first time.

