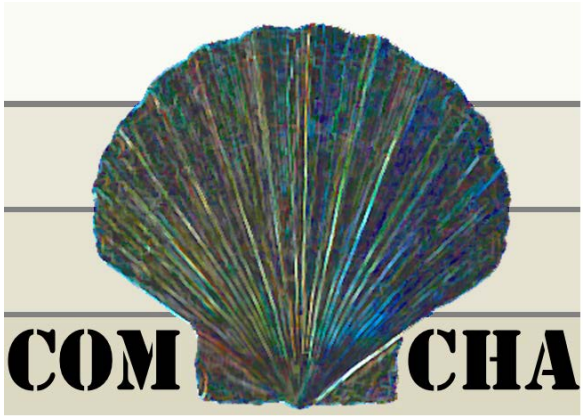
COMCHA activities @ IFIC – Valencia concerning LHCb

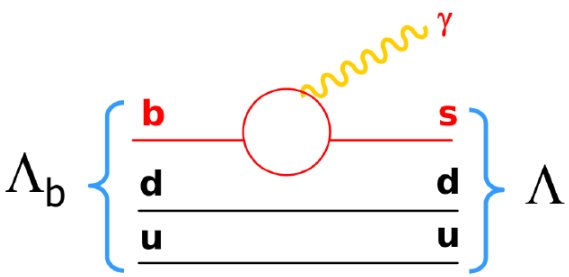


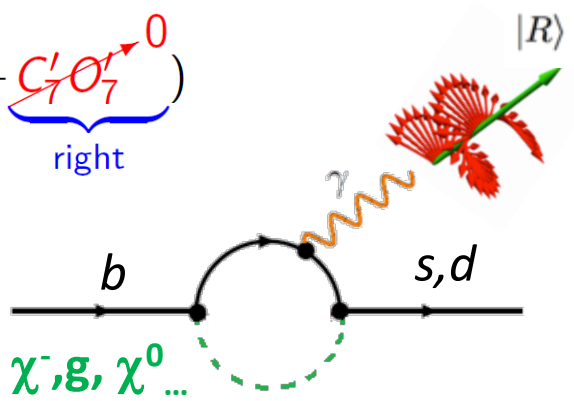
A. Oyanguren

5th June 2018

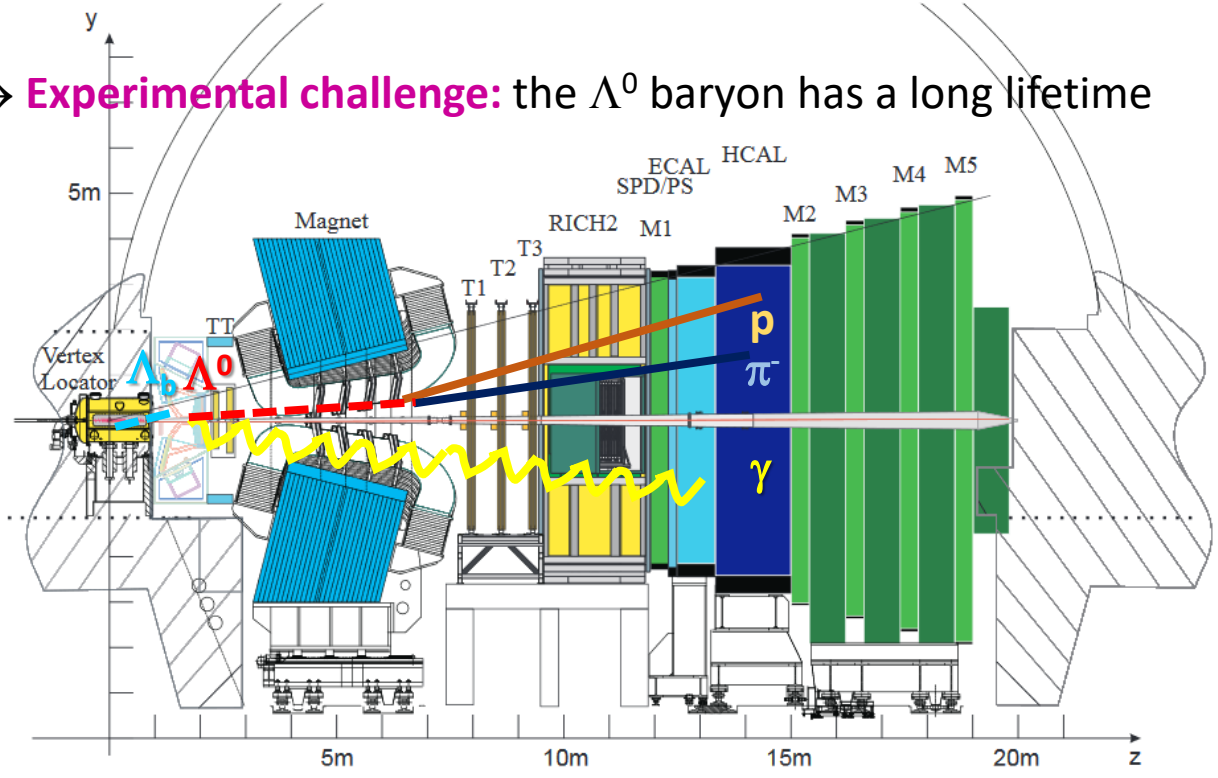
The physics, the problem

$$\mathcal{H}_{eff} = -4\frac{G_F}{\sqrt{2}} V_{ts}^* V_{tb} (\underbrace{C_7 O_7}_{\text{left}} + \underbrace{C_7' O_7'}_{\text{right}}) \quad (C_7' \approx 0)$$





→ **Experimental challenge:** the Λ^0 baryon has a long lifetime

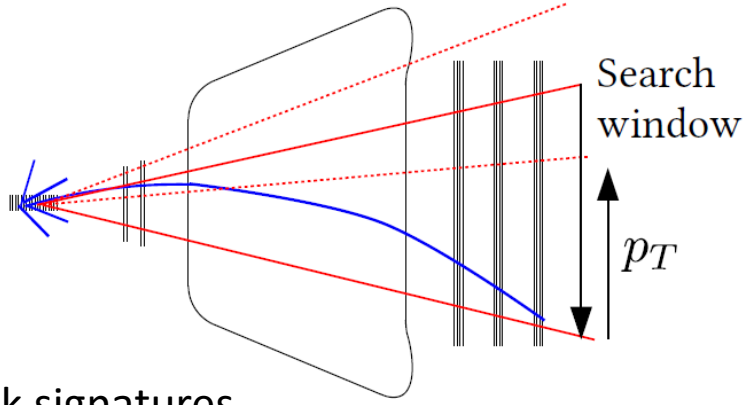


80% of the tracks hitting downstream detectors

The high track combinatorics doesn't allow to trigger them (HLT1)

The physics, the problem

The LHCb High Level Trigger HLT1 is based mainly in signal hits in the VELO (since it is essential to be fast)



→ Primary vertices
→ High p_t tracks
→ Muon ID

Combine information to 1- and 2-track signatures

Hlt1TrackMVA || Hlt1TwoTrackMVA

For radiative b-baryons…

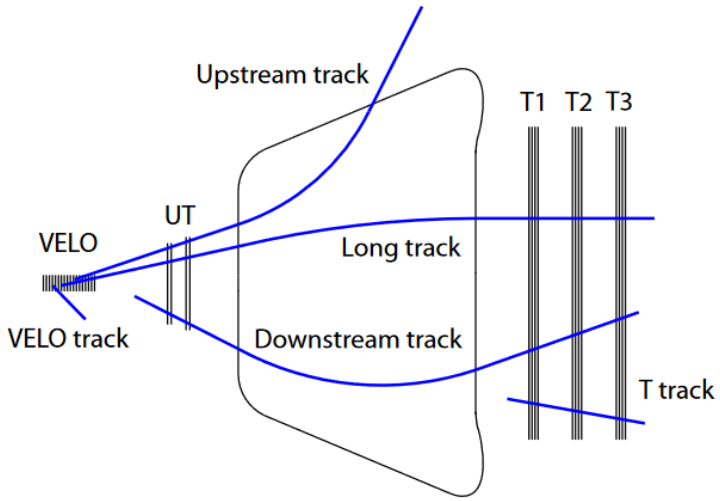
→ L0 efficiencies (L0Photon || L0Electron) **~100%**
→ HLT1 Efficiencies for b-baryon decays **~20-30%**
→ HLT2 efficiencies (dedicated software trigger) **~60%**

The physics, the problem

Upgrade HLT

- VELO tracking
- VELO-UT $p_T > 200$ MeV/c
- Forward reco $p_T > 500$ MeV/c
- PV finding
- Trigger cuts to reduce rate to 1 MHz
- Muon ID
- Simplified Kalman Fit
- Online RICH PID

Reconstruction method	Timing [ms]
VELO-tracking	2.0
VELO-UT tracking	0.5
Forward tracking	2.3
PV finding	1.1
Total	6.0

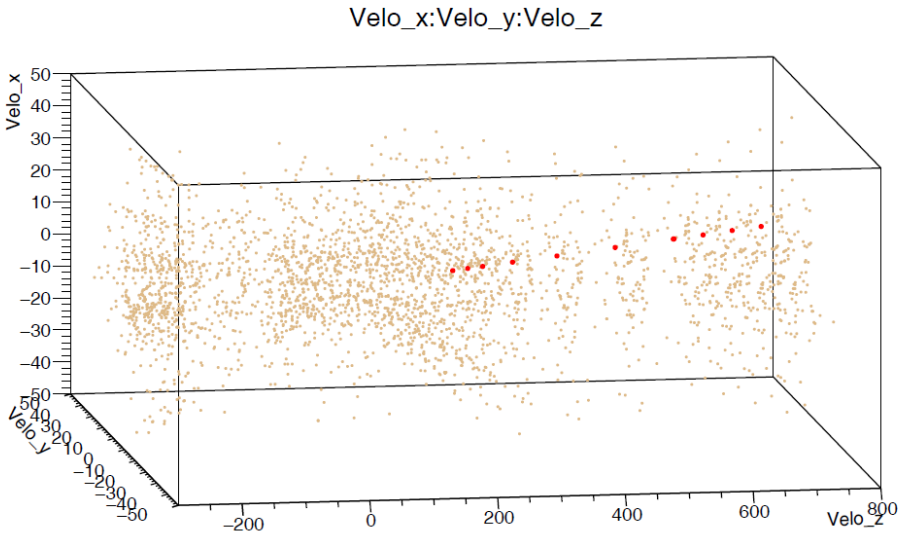


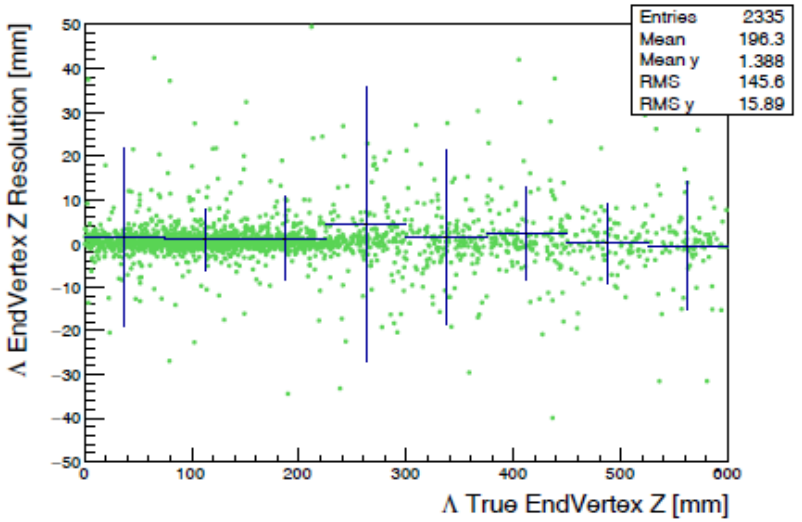
Activities

Aiming to add downstream tracking at HLT1 in LHCb

1) Improve and develop faster algorithms (new ideas!)
2) Increase the level of parallelization
3) Make use of Machine Learning (TBD)
4) Tests on different platforms (GPUs, FPGAs)

Just started: at present understanding the performance of the downstream tracking algorithms





People involved

At IFIC, with partial dedication:

→ Luis Miguel García Martín (PhD)
→ Brij Jashal (Engineer + PhD)
→ Louis Henry (Postdoc)
→ José Mazorra de Cos (Engineer)
→ Arantza Oyanguren (PI)
→ Carlos Sánchez Mayordomo (PhD)
→ (+ new student)