Development of the generic vertex finder in HLT1-level trigger at LHCb

Vladyslav Yankovskyi
Taras Shevchenko National University of Kyiv

Andrii Usachov
VU Amsterdam and Nikhef

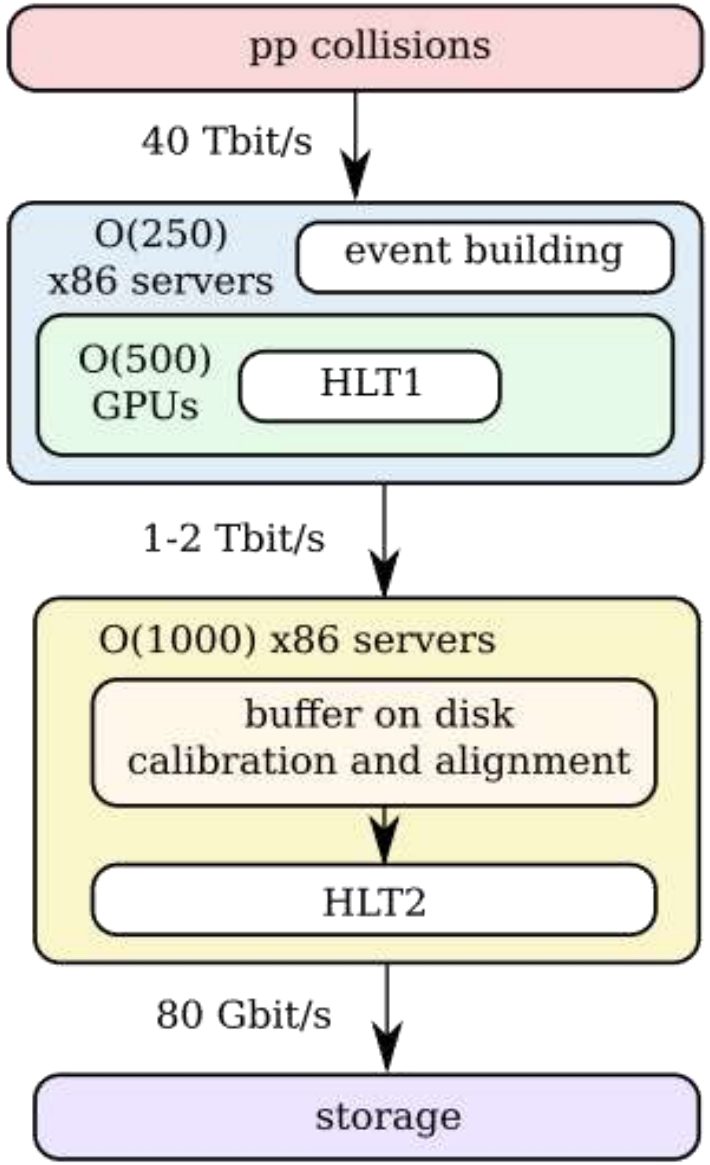
High-level triggers at LHCb

HLT1:

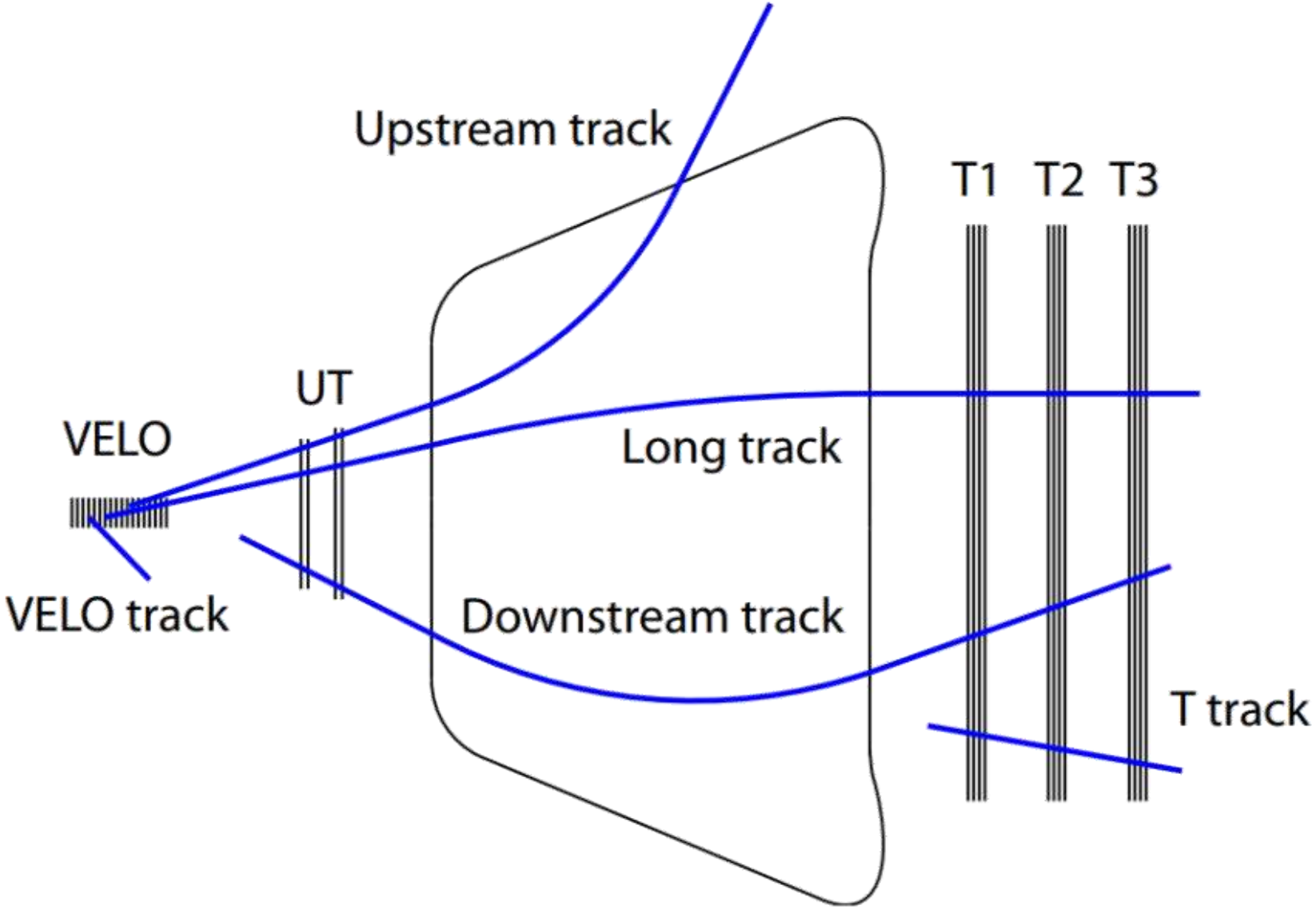
- Performs fast track reconstruction
- First fully GPU-based trigger

HLT2:

- Aligned and calibrated in near-realtime
- Full particle identification
- Track fitting



Track types at LHCb



η_c production on LHCb

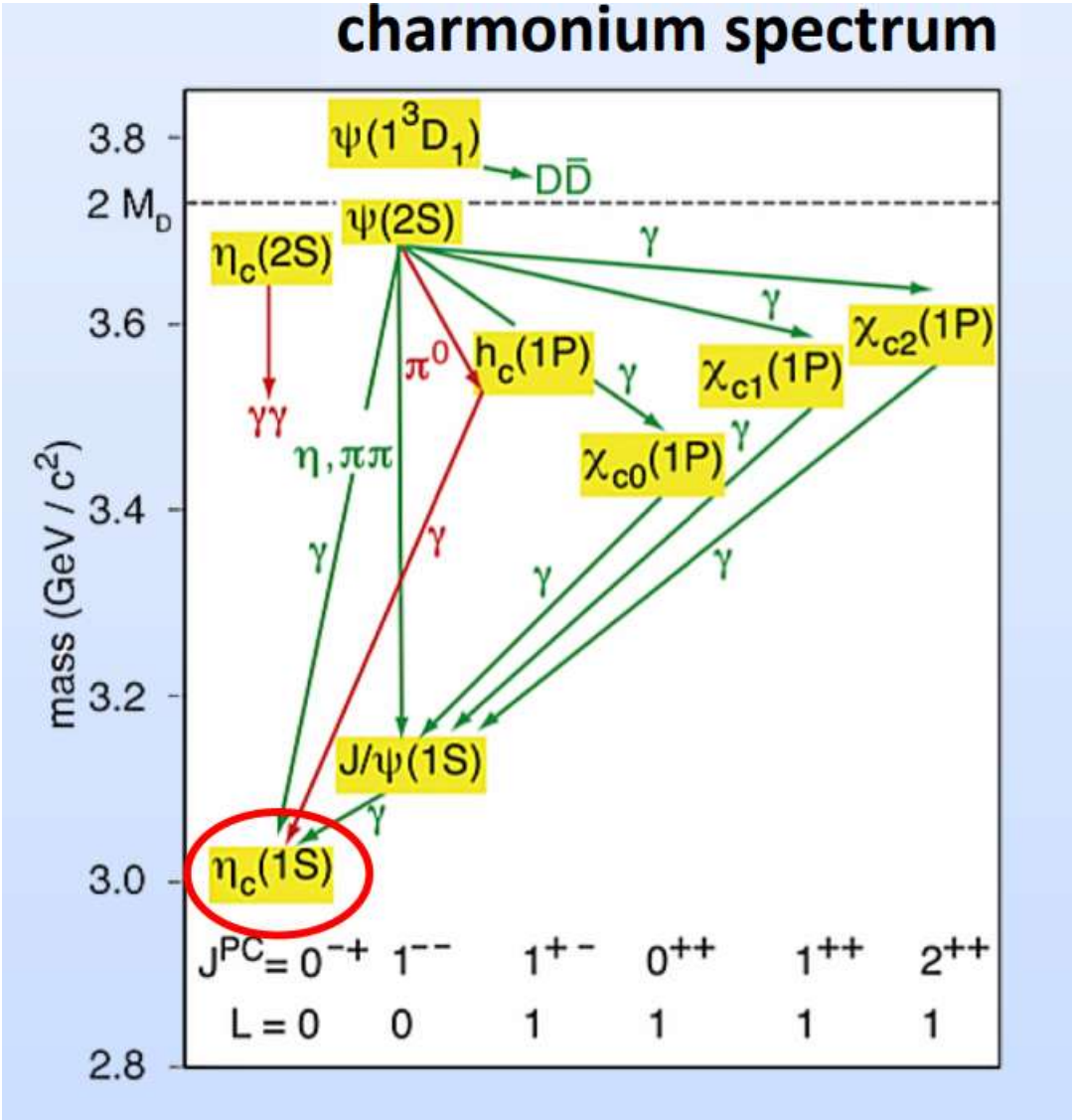
η_c - is ground state charmonium

Decays of B-hadrons:

- *B -> $(p\bar{p})K$, B -> $(K_sK\pi)K$ ma B -> $(\varphi\varphi)\varphi$*

Prompt production in collisions:

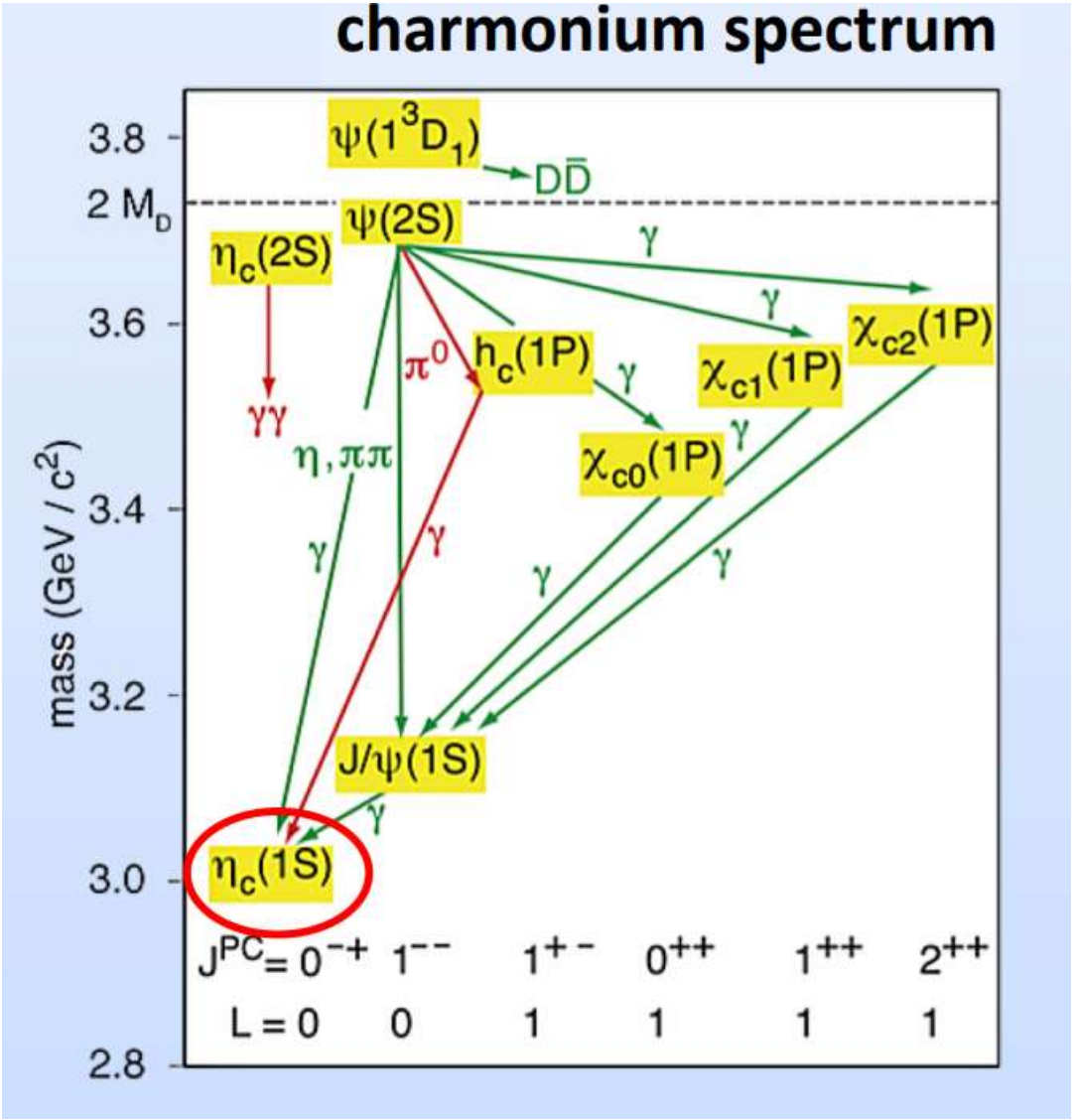
- In Run1 and Run2, the $p\bar{p}$ decay channel was used
- Large background of pions and mis-id



η_c production on LHCb

The decay channel into a pair $\Lambda\bar{\Lambda}$:

- No more combinatorics from pions and mis-id
- Run3 has unique features for working with Downstream tracks
- Using both Long and Downstream tracks for research



Reconstruction generic displaced vertices

The study of long-lived particles can help in the search for the New Physics.

Their effective detection requires a special algorithm that quickly identifies the displaced vertices where these particles appear.

Once this algorithm is developed, it will need a fast CUDA implementation to run online on the LHCb GPU farm.

Main goals of project

- Development of **selection algorithms** for events with the formation of a $\boldsymbol{\Lambda\bar{\Lambda}}$ **pair** using both Long and Downstream tracks.
- Development of a new **algorithms that looks for displaced decay** vertices and their implementation on **CUDA**.

Main goals of project

- Development of **selection algorithms** for events with the formation of a $\Lambda\bar{\Lambda}$ **pair** using both Long and Downstream tracks.
- Development of a new **algorithms that looks for displaced decay** vertices and their implementation on **CUDA**.

Thank you for your attention!