UNIVERSITY OF BRISTOL / LAL ORSAY

Assessments

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June 6, 2015

1 OVERVIEW OF WORK DONE

A description of the work done up to now will be described. It consists in two major blocks. The first one which is related to the analysis work is a work done in between June 2014 and October 2014 , period in which i was finishing the master degree in Ferrara Unviersity and i get the NPAC master 2 at Paris Sud University. The second one is related to the work done in the context of the Upgrade of the LHCb detector consisting in the improvements of the *Seeding* tracking algorithm which actually becomes the development of new algorithm , the *Hybrid Seeding*. The analysis work regards the study of double charm B decays at *LHCb* while the *Seeding Algorithm for the LHCb upgrade* connsists in a software development project.

1.1 SOFTWARE DEVELOPMENT PROJECT : SEEDING ALGORITHM FOR THE LHCB UPGRADE

Before discuss about the work done in this domain a small introduction about the tracking and the upgrade of the *LHCb* detector is mandatory. The data taking at *LHCb* during 2011 and 2012 at LHCb are mainly determined by a few steps.

- The *L0 Trigger* which is implemented at the hardware level aiming to reduce the 40 MHz bunch crossing rate to 1MHz make use of estimation and measurements of the signature of particles having high E_T, p_T.
- *High Level Trigger*: It consists in a software trigger where the tracking algorithms are run. In particular the seeding algorithm (called *PatSeeding*) in the *HLT-I* were runned making use of the left-over hits coming from the forward tracker. To be better described.

  The track reconstruction at *LHCb* is decompose in different steps. The idea is to provide different containers containing different category of tracks. The track classification at *LHCb* is done depending on the path the track goes through, so it's based on the datector's hit content as shown in Fig. **??**. In the tracking system of *LHCb* each track type is reconstructed by a proper

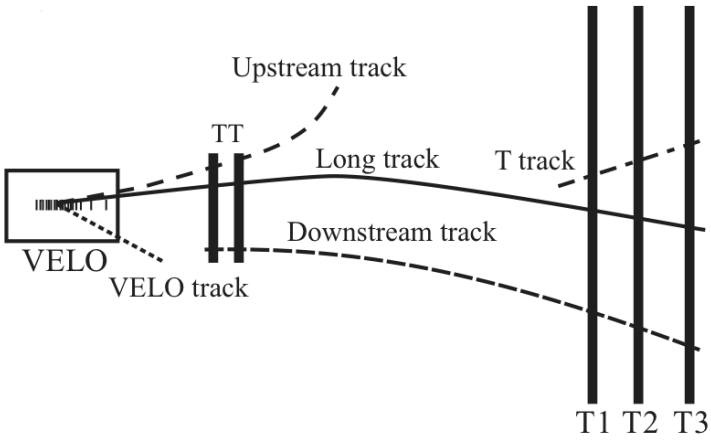

Figure 1.1: Track type at *LHCb*. Velo tracks are basically straight lines since the magnetic field is almost 0 in that region. Tracks are mainly bended in the x-z[1] plane between the Tracker Turicensis (Upstream Tracker for the upgrade) and the T-Stations which is composed by the Inner Tracker(IT) and the Outer Tracker(OT) (Run-I and Run-II), while for the upgrade the stations will be replaced by the Scintillating Fibre tracker (SCIFI).

algorithm and a schematic layout of how things works is given in table **??**.

– Velo tracks and Velo segments : tracks are reconstructed as 3-D object and they fill the container of *Velo tracks* and they are found under the assumpiton that all of them originate from the same point.
– *T-Tracks* , i.e., tracks going through the T-Station (*SciFi* for upgrade) track reconstruction, it is done by the *Seeding* algorithm and it runs as a standalone algorithm (alternitavely it can run on the leftover hits of the *Forward* tracking). It's mainly useful to reconstruct tracks from long-lived particles such as K_s^0 and Λ^0 and in general tracks without *Velo* segment. The *seeding* algorithm ouput is used then to reconstruct *Downstream* tracks, as well as *long* tracks.
– *Long* tracks, which are the most interesting one for physics analysis are reconstructed mainly by two algorithms : the *Forward tracking* which took as input tracks from the *Velo* and propagate them into the *T-station* (*SciFi*) adding also additional informations from the *TT* (*UT* for the upgrade). The second algorithm aiming to reconstruct *Long* tracks is called *Matching* and it combines the output of the *Velo* algorithm and the output of the *Seeding* algorithm.
– *Upstream* tracks are reconstructed throught the *Upstrem* algorithm
– Long

1.1.1 Analysis Work : $B^0 \to D^0\overline{D}^0 K^{*0}$ analysis

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2 Choice of Thesis Topic

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1. First item in a list
2. Second item in a list
3. Third item in a list

3 Timetable for future