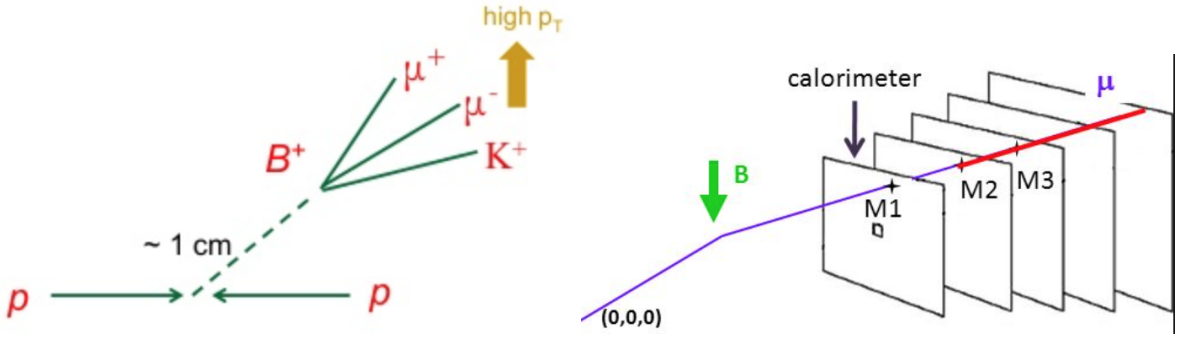
Studies for the LHCb Muon Trigger



- The physics analysis coordinated by the LNF group, $B_{(s,d)} \to \mu^+\mu^-$ and $R(D_s)$, rely on the efficient and clean selection of the muons in their whole kinematical range.
- The LNF group is leader in the development and in the maintenance of the algorithms devoted to the identification of the muons. These algorithms are based on the readout of the LHCb Muon Detector, and are extremely important for the software trigger lines that are responsible to select data samples enriched of b and c hadrons.

The upcoming luminosity upgrade will increase the rate of the incident particles: the most illuminated regions of the Muon Detector will undergo an increase of a factor ~ 8. This requires to improve the signal purity for decays with muons in the final state, keeping high the identification efficiency on the whole kinematical range of the muons. We are working on the development of new algorithms exploiting the full information of the Muon Detector, and making use of machine learning algorithms, developed also in commercial data science.

Another challenge that we are facing is to keep the timing of the muon identification algorithms within ~ 1 ms per event. This is of paramount importance to run the code within the LHCb software trigger lines.

Possible subjects to develop as a thesis are:

1. **Development of a discriminating variable, based on machine learning algorithms, to increase the muon identification efficiency in the low p_T range.**
2. **Development of a low level software trigger line, based on the LHCb Muon Detector stand-alone reconstruction of the muon tracks.**

contacts Patrizia de Simone (patrizia.desimone@lnf.infn.it),
Barbara Sciascia (barbara.sciascia@lnf.infn.it)