Contribution ID: **3** Type: **Oral presentation**

The upgrade of the LHCb trigger system

Thursday 15 May 2014 16:30 (30 minutes)

The current LHCb trigger system consists of a hardware level, which reduces the LHC inelastic collision rate of 30 MHz to 1 MHz, at which the entire detector is read out. In a second level, implemented in a farm of 20k parallel-processing CPUs, the event rate is reduced to about 5 kHz. The major bottleneck in LHCb's trigger efficiencies for hadronic heavy flavour decays is the hardware trigger. The LHCb experiment plans a major upgrade of the detector and DAQ system in the LHC shutdown of 2018. In this upgrade, a purely software based trigger system is being developed, which will have to process the full 30 MHz of inelastic collisions delivered by the LHC. We demonstrate that the planned architecture will be able to meet this challenge, particularly in the context of running stability and long term reproducibility of the trigger decisions. We discuss the use of disk space in the trigger farm to buffer events while performing run-by-run detector calibrations, and the way this real time calibration and subsequent full event reconstruction will allow LHCb to deploy offline quality multivariate selections from the earliest stages of the trigger system. We discuss the cost-effectiveness of such a software-based approach with respect to alternatives relying on custom electronics. We discuss the particular importance of multivariate selections in the context of a signal-dominated production environment, and report the expected efficiencies and signal yields per unit luminosity in several key physics benchmarks the LHCb upgrade.

Authors: FITZPATRICK, Conor (CERN); RAVEN, Gerhard (Natuurkundig Laboratorium-Vrije Universiteit (VU)-Unknown); ALBRECHT, Johannes (Technische Universitaet Dortmund (DE)); GLIGOROV, Vladimir (CERN)

Presenter: FITZPATRICK, Conor (CERN)