T 79: Invited Topical Talks 5

Time: Thursday 14:00–15:30 Location: Geb. 30.21: Gerthsen-HS

Invited Topical Talk T 79.1 Thu 14:00 Geb. 30.21: Gerthsen-HS

Construction, Commissioning, and Performance of the new ATLAS Level1-Trigger System for Run 3 — •Ralf Gugel — JGU Mainz

Already before the formal transition from LHC to HL-LHC various improvements on the accelerator side provide opportunities and challenges alike: higher instantaneous luminosity as well as increased pileup. In order to maximally benefit from this during the LHC Run 3 and as a first step towards HL-LHC, the ATLAS Level1-Trigger System has been upgraded in order to improve the accuracy of selecting the most interesting collisions. Following a brief introduction to requirements and resulting design choices for such a system the additions and modifications to the ATLAS Level1-Trigger System are presented with a focus on the calorimeter based trigger path. Further more selected aspects of the integration of the new subsystems among each other and into ATLAS, and achieved/anticipated physics performance are discussed.

Invited Topical Talk T 79.2 Thu 14:30 Geb. 30.21: Gerthsen-HS

Hadronic signals at the LHC: timing as a handle to face the challenges of higher luminosity — •Margherita Spalla — Max-Planck-Institut für Physik, München

The physics programme at the Large Hadron Collider (LHC) relies on measuring increasingly rare processes with high precision, while coping with the busier environment driven by increased luminosity. An efficient signal reconstruction is the first step towards this goal. During the LHC Run 1 and 2, the ATLAS experiment has mostly relied on measured energy and momentum, as well as fine detector segmentation. Even though this method has proven highly performant, it is sensitive to the piling-up effect of hadrons from additional soft collisions (*pile-up*). Integrating a precise measurement of signal timing into the existing reconstruction is gaining interest as a way to improve pile-up suppression. While a dedicated High-Granularity Timing Detector is expected to provide timing information for tracking at the High-Luminosity LHC, a measurement of signal timing is already provided in the current detector by the ATLAS calorimeters. Calorimeter signals are reconstructed based on energy signal-to-noise ratio, they provide the basis for the reconstruction of jets, electrons, photons and τ-leptons. The introduction of a timing criterion in the topological clustering algorithm is shown to suppress pile-up originated jets by $\sim 50\%$ or more, with no reduction in signal reconstruction efficiency. Such large pile-up suppression also reduces the average ATLAS event size by 6%, improving resource consumption. This method has been adopted as the Run 3 default.

Invited Topical Talk T 79.3 Thu 15:00 Geb. 30.21: Gerthsen-HS

The LHCb Mighty Tracker - Getting ready for flavour physics at the HL-LHC — •Klaas Padeken — HISKP University Bonn

With Upgrade II of the LHCb Experiment (LS4 of the LHC 2033/2034) the instantaneous luminosity at Point 8 will be increased by an factor 10 to $1.5 \times 10^{34}\mathrm{cm}^{-2}\mathrm{s}^{-1}$. This requires a redesign of the LHCb tracking system. For the downstream tracker a hybrid system of monolithic pixel sensors in the central part and scintillating fibers in the outer part is foreseen. The detector will cover a η region of 2 to 5, while keeping a triggerless streaming readout (at 40MHz) and improving the momentum resolution to $\sigma_p/p \approx 0.3\%$. The challenge is to keep the material budget for the pixel part, including all services, below $1\,\%\,\mathrm{X}/\mathrm{X}_0$ per layer, and to read out the fibres with an increased hit rate of up to $20\,\mathrm{MHz}/\mathrm{cm}^2$. While the material budget can be reduced using monolithic sensors and a cooling solution, the latter part can only be solved by cooling the readout SiPMs to cryogenic temperatures.
This talk will give an overview of the LHCb Upgrade II plans and motivate the construction of a large scale state of the art hybrid detector, which will continue to add flavour to the physics program of the LHC.