T 67: Detektorsysteme III

Zeit: Mittwoch 16:00–18:30 Raum: S03

T 67.1 Mi 16:00 S03

Tracking efficiencies for the track selections in the track-counting luminosity measurement in ATLAS. — •Surabhi Sharma — DESY, Hamburg

Particle production at the Large Hadron Collider (LHC) is driven by two important parameters: the center of mass energy and the luminosity. The luminosity is a measure of how many collisions happen in an accelerator per second and area. An accurate measurement of the luminosity at the LHC is an important objective for the ATLAS experiment and high precision of the luminosity measurement is essential to fulfill the ATLAS physics goals. The luminosity measurement with the track-counting method requires high and stable efficiencies for the selection of tracks in the Inner Detector of ATLAS. The reconstructed and selected charged particle tracks use mainly information from the silicon pixel and strips detectors in ATLAS.

In this context, the tracking efficiencies for the track selections used in the track counting luminosity measurement using Z ->mumu events are calculated. The techniques used to calculate the tracking efficiencies and the first look at the ATLAS data from 2018 will be shown in this presentation.

T 67.2 Mi 16:15 S03

Cross detector stability and linearity uncertainty for the integrated luminosity measurement in 2015 and 2016 in the CMS detector. — Olaf Behnke, Joscha Knolle, Andreas Meyer, and •Rafael Sosa — CMS - DESY Hamburg

The integrated luminosity recorded and measured by the CMS Experiment establishes the reference for cross section measurements of physics processes and the sensitivity reach of searches for new physics. The stability and linearity of the detectors used to measure the luminosity play an important role in the uncertainty estimation for the integrated luminosity value.

During the 2015 and 2016 data taking period, the Pixel Cluster Counting (PCC) was the primary offline luminometer, but also other detectors like the Drift Tubes (DT) and the HF (Forward Hadronic Calorimeter) provided luminosity measurements that can be used either for comparison or even to replace the PCC as the reference in some cases. The procedure and results on the cross detector stability and linearity between these detectors will be presented as well as the impact on the integrated luminosity uncertainty.

T 67.3 Mi 16:30 S03

Simulating Defects in the ITk Pixel Detector — •Kira Abeling, Timo Dreyer, Jason Veatch, and Stan Lai — Georg-August-Universität Göttingen

Around 2026, the current ATLAS Inner Detector will be replaced by the Inner tracker (ITk) in preparation for the coming higher luminosity of the HL-LHC but also with the higher radiation which can degrade silicon detector performance or disable readout electronics.

This talk presents how defects in the ITk pixel detector are simulated and how these defects affect track reconstruction. Different scenarios are simulated, including malfunctioning modules due to random failure or due to radiation problems, all of which are crucial to investigate in order to quantify failure and risk scenarios of the ITk before it is built.

T 67.4 Mi 16:45 S03

Long Term Studies of the Tracking Efficiency for the LHCb SciFi-Tracker — •Holger Stevens and Martin Bieker — Experimentelle Physik 5, TU Dortmund

The LHCb-Detector is upgraded in the ongoing shutdown of the Large Hadron Collider. Among other things the tracking stations will be replaced by the so called SciFi-Tracker. This tracker is made of scintillating fibres.

The light output of the fibres decreses during the life time of the detector, which is caused by two major factors. On the one hand the irradiation of the fibres caused by the operation of the LHC. On the other hand natural aging of the material.

This talk will show possibilities to simulate these effects and estimate the tracking efficiency of the Scifi-Tracker during the planed data taking period of 10 years.

T 67.5 Mi 17:00 S03

Momentum transfer reconstruction for the P2 Experiment — •Alexey Tyukin — Institute for Nuclear Physics, Johannes Gutenberg University, Mainz

The P2 experiment at the future MESA accelerator in Mainz will determine the weak mixing angle, a core parameter of the Standard Model. The high precision of this measurement stems from the use of elastic electron-proton scattering, which has a 39 ppb cross-section asymmetry between the two electron helicity states. This asymmetry depends on the momentum transfer Q^2 of the scattering process. The experiment will be performed by injecting a high intesity electron beam into a liquid hydrogen target and measuring the outgoing particles.

The P2 detector will consist of a solenoid magnet surrounding the target and two main detector systems: a ring of fused silica crystals as an integrating cherenkov detector and four tracking planes consisting of thin high voltage monolithic active pixel sensors (HV-MAPS). The trajectories of electrons hitting all four tracking planes will be reconstructed to give an estimate on the Q^2.

A Geant4 simulation is used to produce realistic detector hit distributions to test the Q^2 recontruction performance. The average Q^2 value of $0.006\,\mathrm{GeV}^2/c^2$ can be reconstructed with about 4% uncertainty for a single event, leading to a high overall precision due to large electron rates of the experiment.

T 67.6 Mi 17:15 S03

Tracking of charged particles using an FE-I4B pixel tracker and moving emulsion films — Matei Climescu, Fabian Hügging, Jens Janssen, Vadim Kostyukhin, •Nikolaus Owtscharenko, David-Leon Pohl, and Markus Cristinziani — Physikalisches Institut, Universität Bonn

The SHiP collaboration plans a general purpose fixed-target experiment to search for hidden particles at a new beam-dump facility at the CERN SPS.
To estimate the total charm cross-section, including hadronic cascade production, in the final experiment, a dedicated measurement was performed. 400 GeV protons from the SPS interacted with a thick target, events were then recorded by a dedicated spectrometer consisting of emulsion plates, a pixel tracker, a magnetic field, scintillating fibers, drift tubes and RPCs.
The pixel tracker was composed of 12 ATLAS IBL double chip modules, arranged in 6 planes, complementing the high spatial resolution of the emulsion detector with a high timing resolution.
Setup and first results of this testbeam are presented.

T 67.7 Mi 17:30 S03

Implementation of a pixel tracker into simulation and comparison with data in a charm cross-section measuring testbeam. — •Matei Climescu, Fabian Hügging, Jens Janssen, Vadim Kostyukhin, Nikolaus Owtscharenko, David-Leon Pohl, and Markus Cristinziani — Physikalisches Institut, Universität Bonn

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The resulting data is compared to the simulation and will be used to tune it.

T 67.8 Mi 17:45 S03

A Multivariate Track Quality Estimation for the Belle II Experiment — Florian Bernlochner, Nils Braun, •Michael Eliachevitch, and Felix Metzner for the Belle 2-Collaboration — ETP, KIT, Karlsruhe

Starting from April 2018 The Belle II experiment at the SuperKEKb accelerator facility in Tsukuba, Japan, has successfully recorded first

collisions data for calibration and testing purposes, to prepare the physics data taking in early 2019. Many analyses rely on the ability of the Belle II detector and software to correctly reconstruct all tracks originating from a $B\bar{B}$ decay event. Depending on their sensitivity to falsely reconstructed tracks and the rarity of their signal processes, different analyses can profit from a varying trade-off between the tracking efficiency and purity. In this talk, I present a method for a quality estimation of tracks in the Belle II Analysis Software Framework, which combines information from the different subdetectors and their respective tracking algorithms by employing multivariate analysis techniques. It provides a track quality indicator that can be used to choose and an optimal working point on the efficiency vs. purity receiver operating curve at analysis level.

T 67.9 Mi 18:00 S03

Time-dependence in CMS tracker alignment — •Henriette Petersen — DESY, Hamburg, Germany

The Compact Muon Solenoid (CMS) is a general-purpose detector located at the Large Hadron Collider (LHC) at CERN. The high granularity silicon tracker of CMS with 1856 pixel and 15148 strip modules provide accurate track reconstruction. To achieve high precision, corrections for the position, rotation and curvature of these modules must be found; such a procedure is known as tracker alignment. Magnet cycles, temperature variations and ageing of modules cause significant time variations that affect the track reconstruction and therefore necessitate continuous alignment throughout the operation of the LHC machine. In 2017 and 2018 the LHC generated the highest instantaneous luminosity to date leading to fast changes in the pixel detector due to the proximity to the interaction region. This talk will elucidate the strategy to include a time dependence of the alignment.

T 67.10 Mi 18:15 S03

Systematic studies of track-based alignment of the CMS tracker — •Josry Metwally — DESY, Hamburg, Germany

The CMS (Compact Muon Solenoid) tracker is the largest silicon tracker in the world, consisting of a large number of pixel (1856) and strip (15148) modules to ensure a precise reconstruction of tracks and vertices. In order to fully exploit the precision of the local reconstruction of the silicon modules, we use a track-based approach to align the modules. The number of alignment parameters is of the order of 100k and its determination is achieved by the means of the linear least-squares method (χ^2), while residuals between the hits and the reconstructed track are minimised. Continuous transformations called weak modes corresponding to transformations to which the χ^2 fit is not very sensitive are one of the major challenges of track-based alignment. In this talk, systematic studies to control weak modes are presented.