

T 24: Detector systems II

Time: Tuesday 17:00–18:35

Location: H-HS II

Group Report

T 24.1 Tue 17:00 H-HS II

The Mu2e experiment at Fermilab — ●STEFAN E. MÜLLER and ANNA FERRARI for the Mu2e-Collaboration — Helmholtz-Zentrum Dresden-Rossendorf, Dresden, Germany

The Mu2e experiment, currently under construction at the Fermi National Accelerator Laboratory near Chicago, will search for the neutrinoless conversion of muons to electrons in the field of an aluminum nucleus. In the Standard Model, this process, which violates charged lepton flavor, is highly suppressed and therefore undetectable. However, scenarios for physics beyond the Standard Model predict small but observable rates. The Mu2e experiment aims for a sensitivity four orders of magnitude better than existing experiments. This is achieved by a rigorous control of all backgrounds that could mimic the monoenergetic conversion electron.

At the Helmholtz-Zentrum Dresden-Rossendorf, we use the ELBE radiation facility to study radiation hardness and performance of components for the Mu2e calorimeter and the detector that will monitor the rate of stopped muons in the aluminum target. Additionally, Monte Carlo simulations are performed for both the pion production target and the muon stopping target.

In the presentation, the design and status of the Mu2e experiment and its detectors will be presented, and results from the ELBE beam-times and the simulation studies will be given.

T 24.2 Tue 17:20 H-HS II

Commissioning of the LHCb Scintillating Fibre Tracker — SEBASTIAN BACHMANN, DANIEL BERNINGHOFF, XIAOXUE HAN, BLAKE LEVERINGTON, ULI UWER, and ●LUKAS WITOLA — Physikalisches Institut, Heidelberg, Deutschland

The LHCb detector is currently undergoing a major upgrade. The modifications will enable the detector to operate at an increased instantaneous luminosity and to read out data at the LHC bunch crossing rate of 40 MHz. The new operating conditions require the replacement of the complete tracking system. The main tracking stations will be replaced by the SciFi Tracker, a large, high granular scintillating fibre tracker readout by arrays of silicon photomultipliers (SiPMs). A custom ASIC is used to digitise the SiPM signals at 40 MHz. Further digital electronics perform clustering and data-compression before the data is sent via optical links to the DAQ system.

The detector modules together with the readout electronics and all services are mounted on so-called C-Frames. After a first prototype has been build and tested, the serial assembly of frames has started in March 2019. The talk will give an overview of the detector and present experiences from the serial production and the latest commissioning results.

T 24.3 Tue 17:35 H-HS II

Hochratentests an der CMS Binary Chip Ausleseketten — FELIX BÖGELSPACHER, ALEXANDER DIERLHAMM, ULRICH HUSEMANN, ●STEFAN MAIER und THOMAS MÜLLER — Institut für Experimentelle Teilchenphysik, Karlsruher Institut für Technologie

Für den äußeren Bereich des zukünftigen CMS-Spurdetektors werden im Rahmen des Phase-2-Upgrades Siliziumsensormodule eingesetzt. Diese Module bestehen aus zwei dicht übereinander liegenden Sensoren und sind damit in der Lage Teilchen mit hohem Transversalimpuls bereits im Auslesechip, dem CMS Binary Chip (CBC), zu identifizieren. Dies ist Startpunkt für einen neuartigen spurbasierten Trigger, mit dem interessante Ereignisse angereichert werden können.

Der Vortrag stellt den KARATE-Aufbau (KARlsruhe high RATE TEst) vor. Um einen Siliziumsensor zu emulieren werden auf 48 Kanä-

len des CBCs in hohen Raten Pulsmuster injiziert. Es können beliebige Muster mit unterschiedlichen Pulshöhen, Clustergrößen, Positionen und Triggerraten erzeugt werden. Somit werden Okkupanz und mittlere Ausleseraten in verschiedensten Variationen auf dem Chip und der nachfolgenden Ausleseketten für den späteren Betrieb nachgestellt. Der Vortrag gibt Einblick in die Signalerzeugung und stellt eine Auswahl an Hochratenergebnissen vor.

T 24.4 Tue 17:50 H-HS II

Characterization of Power Hybrids for CMS Outer Tracker PS modules — ●ALEXANDER BOGNER¹, CHRISTIAN DZIWK², LUTZ FELD¹, KATJA KLEIN¹, MARTIN LIPINSKI¹, ALEXANDER PAULS¹, OLIVER POOTH², NICOLAS RÖWERT¹, and TIM ZIEMONS² — ¹I. Physikalisches Institut B, RWTH Aachen University — ²III. Physikalisches Institut B, RWTH Aachen University

For the Phase-2 Upgrade of the CMS Outer Tracker the CMS Collaboration is developing modules with two strip sensors (2S module) and modules with a strip and macro-pixel sensor (PS module). The upgrade will allow CMS to utilize the high luminosity provided by the future HL-LHC. The powering of an entire PS module will be driven by a so-called Power Hybrid (POH) featuring three DC-DC converters.

At RWTH Aachen University the POHs have been developed and were qualified regarding power stability, noise radiation and temperature profiles. In this talk the results and experience gained is presented.

T 24.5 Tue 18:05 H-HS II

Electron Identification Studies of Belle II — ●JUSTIN SKORUPA for the Belle II-Collaboration — Max Planck Institute for Physics, Muenchen, Bayern

The Belle II experiment at the SuperKEKB e^+e^- accelerator in Tsukuba, Japan, aims to precisely measure parameters of the Standard Model (SM) and to discover physics beyond the SM via high precision measurements of rare processes. Physics processes studied by the experiment are for example B-Mesons or tau decays. Many of those decays contain leptons in the final state. The experiment is therefore required to provide a reliable lepton identification method, and the performance of this method must be precisely determined. A study of the electron identification (eID) and detector performance, using non-radiative Bhabha events as a control channel, is presented. Bhabha-like candidates are selected and a tag and probe approach is then used to assess the performance of the eID. This study shows that the Belle II eID provides a significant reduction of mis-identified tracks, while retaining electrons with a very high efficiency.

T 24.6 Tue 18:20 H-HS II

Tracking performance and interaction point properties at the Belle II experiment — ●CYRILLE PRAZ for the Belle II-Collaboration — DESY, Hamburg, Germany

The Belle II experiment, located in Tsukuba, Japan along the SuperKEKB e^+e^- collider, is aiming to reach in the years to come an instantaneous luminosity of $8 \times 10^{35} \text{ cm}^{-2} \text{ s}^{-1}$, a value ~ 40 times larger than the instantaneous luminosity delivered for the previous experiment (Belle). Compared to Belle, the Belle II experiment offers also a better impact parameter resolution, thanks to an improved vertex detector. This presentation gives a brief overview of the Belle II tracking system and shows a measurement of the impact parameter resolution and of several properties of the interaction point using a selection of $e^+e^- \rightarrow e^+e^-$ and $e^+e^- \rightarrow \mu^+\mu^-$ events collected in 2019 at a centre-of-mass energy of 10.6 GeV.