T 4: Detektorsysteme I

Zeit: Montag 14:00–16:05 Raum: L.09.28 (HS 12)

Gruppenbericht T 4.1 Mo 14:00 L.09.28 (HS 12)

Luminosity Measurement and Beam Condition Monitoring at CMS — •Jessica Lynn Leonard — DESY, Zeuthen, Germany

The BRIL system of CMS consists of instrumentation to measure the luminosity online and offline, and to monitor the LHC beam conditions inside CMS. An accurate luminosity measurement is essential to the CMS physics program, and measurement of the beam background is necessary to ensure safe operation of CMS. In expectation of higher luminosity and denser proton bunch spacing during LHC Run II, many of the BRIL subsystems are being upgraded and others are being added to complement the existing measurements.

The beam condition monitor (BCM) consists of several sets of diamond sensors used to measure online luminosity and beam background with a single-bunch-crossing resolution. The BCM also detects when beam conditions become unfavorable for CMS running and may trigger a beam abort to protect the detector. The beam halo monitor (BHM) uses quartz bars to measure the background of the incoming beams at larger radii. The pixel luminosity telescope (PLT) consists of telescopes of silicon sensors designed to provide a CMS online and offline luminosity measurement. In addition, the forward hadronic calorimeter (HF) will deliver an independent luminosity measurement, making the whole system robust and allowing for cross-checks of the systematics. Data from each of the subsystems will be collected and combined in the BRIL DAQ framework, which will publish it to CMS and LHC.

The current status of installation and commissioning results for the BRIL subsystems will be given.

T 4.2 Mo 14:20 L.09.28 (HS 12)

STYX - bringing new life into old detectors — •Elena Zarkh — Physikalisches Institut, Bonn, Germany

STYX stands for Straw Tube Young student eXperiment and is a part of the master laboratory course at the University of Bonn. The experiment use muons from the secondary cosmic rays and aims to provide a basic understanding of the cosmic radiation, gas detectors, tracking of charged particles, readout electronics and computer-based data analysis. The heart of the experiment is a gaseous straw tube detector, built from the decommissioned ZEUS detector at DESY, and as a trigger system two photomultipliers are used. The setup of the experiment and recent developments will be presented.

T 4.3 Mo 14:35 L.09.28 (HS 12)

ASIC for Time-of-Flight Measurements with picosecond timing resolution — •Vera Stankova, Wei Shen, and Tobias Harion — Kirchhoff-Institute for Physics,Heidelberg, Germany

The Positron Emission Tomography (PET) images are especially affected by a high level of noise. This noise affects the potential to detect and discriminate the tumor in relation to the background. Including Time-of-Flight information, with picosecond time resolution, within the conventional PET scanners will improve the signal-to-noise ratio (SNR) and in sequence the quality of the medical images. A mix-mode ASIC (STIC3) has been developed for high precision timing measurements with Silicon Photomultipliers (SiPM). The STiC3 is 64-channel chip, with fully differential analog front-end for crosstalk and electronic noise immunity. It integrates Time to Digital Converters (TDC) with time binning of 50.2 ps for time and energy measurements. Measurements of the of the analog front-end show a time jitter less than 20 ps and jitter of the TDC together with the digital part is around 37 ps. Further the timing performance of a channel has been tested by injecting a pulse into two channels and measuring the time difference of the recorded timestamps. A Coincidence Time Resolution (CTR) of 215 ps FWHM has been obtained with 3.1 x 3.1x 15 mm2 LYSO:Ce scintillator crystals and Hamamatsu SiPM matric (S12643-050CN(x)). Characterization measurements with the chip and its performances will be presented.

T 4.4 Mo 14:50 L.09.28 (HS 12)

Upgrade of the Muon Veto and current status of the Dortmund Low Background HPGe Facility — Claus Gössling, Kevin Kröninger, Till Neddermann, •Christian Nitsch, and Thomas Quante — TU Dortmund, Physik EIV, D-44221 Dortmund

The Dortmund Low Background HPGe Facility (DLB) is a germanium facility with heavy shielding located above ground. It's primary task is to provide material screening support for the COBRA experiment which was built to search for neutrinoless double beta decay.

Germanium detectors used for low background gamma spectroscopy are usually operated under either a fairly low overburden (O(1m) water equivalent (mwe)) or high overburden, e.g. in specialised underground laboratories (O(>100mwe)). In between, only a few facilities exist, such as the DLB. The artificial overburden of 10mwe already shields the weak component of cosmic rays. The lead castle with a state-of-the-art neutron shielding as well as the active anti-cosmics veto detector enable low background gamma spectrometry with the advantage of good accessibility on the university campus.

Throughout the last years improvements have been made especially on the cosmics veto and the MC simulation leading to an remarkable low integral background counting rate (40-2700 keV) of about 2.5228(52) counts/kg/min. The talk will summarise the completed tasks and present the current status.

T 4.5 Mo 15:05 L.09.28 (HS 12)

Expected Performance of the ATLAS Transition Radiation Tracking Detector With $ArCO_2O_2$ in Run-2 of the LHC — Philip Bechtle, Klaus Desch, Christian Grefe, •Oliver Ricken, and Peter Wagner — Universität Bonn

The Transition Radiation Tracker (TRT) is one of the three components of the ATLAS Inner Detector. It is a straw tube tracker designed to provide information on track reconstruction and particle identification.
In the proton-proton phase of Run-1 of the LHC, the TRT was operated with the $XeCO_2O_2$ gas mixture it was originally designed with. However, due to the evolution of irreparable gas leaks during operation in Run-1, the exclusive use of $XeCO_2O_2$ will result in costly Xenon loss. The solution aimed at is to operate the most significantly affected parts of the TRT with an $ArCO_2O_2$ gas mixture in Run-2.
This talk covers the process of developing the proposed mode of operation of the ATLAS TRT in Run-2 based on studies of simulations of different operation scenarios. Along with the validation of the simulations, the analysis of the performance of the TRT detector in different possible Run-2 scenarios is presented.

T 4.6 Mo 15:20 L.09.28 (HS 12)

Entwicklung eines kombinierten Ultraschallflussmessers und Gasmischungsmessgeräts für das ATLAS Experiment — Muhammad Alhroob[1], Richard Bates[2], Michele Battistin[3], Stephane Berry[3], Alexander Bitadze[2], Pierre Bonneau[3], Nicolas Bousson[3], Rusty Boyd[1], Gennaro Bozza[3], Olivier Crespo-Lopez[3], Cyril Degeorge[4], •Cecile Deterre[5], Beniamino Di Girolamo[3], Martin Doubek[6], Gilles Favre[3], Jan Godlewski[2], Gregory Hallewell[7], Ahmed Hasib[1], Sergei Katunin[8], Nicolas Langevin[7], Didier Lombard[3], Michel Mathieu[8], Stephen McMahon[9], Koichi Nagai[10], Abigail O'Rourke[5], Ben Pearson[1], Dave Robinson[11], Cecilia Rossi[12], Alexandre Rozanov[7], Michael Strauss[1], Vaclav Vacek[6] und Lukasz Zwalinski[3] — [1]Department of Physics and Astronomy, University of Oklahoma, Norman, USA — [2]SUPA School of Physics and Astronomy, University of Glasgow, Glasgow, UK — [3]CERN, Switzerland — [4]Department of Physics, Indiana University, Bloomington, USA — [5]DESY, Hamburg, Germany — [6]Czech Technical University in Prague,Department of Applied Physics, Prague, Czech Republic — [7]Centre de Physique des Particules de Marseille, Aix-Marseille Université, CNRS/IN2P3, Marseille, France — [8]B.P. Konstantinov Petersburg Nuclear Physics Institute (PNPI), St. Petersburg, Russia — [9]Rutherford Appleton Laboratory - Science and Technology Facilities Council, Didcot, UK — [10]Department of Physics, Oxford University, Oxford, UK — [11]Department of Physics and Astronomy, Cavendish Laboratory, University of Cambridge, Cambridge, UK — [12]Academy of Sciences of the Czech Republic, Prague, Czech Republic

In einer Mischung von zwei Gasen können über eine Schallgeschwindigkeitsmessung der Gasanteil und -fluss bestimmt werden. Ultraschallinstrumente werden in ATLAS entwickelt und haben im Detektorsteuerungssystem mehrere Verwendungen, die wir hier vorstellen. In der Endkonfiguration werden drei Instrumente benutzt, um Leckraten vom Kühlmittel im Trackervolumen zu überwachen. Zwei andere Instrumente werden das Kühlsystem kontrollieren.

Wir stellen die Messprinzipien vor, sowie Softwareentwicklung und

Inbetriebsetzung während der LHC Abschaltung in 2013. Desweiteren werden wir neue Resultate präsentieren.

T 4.7 Mo 15:35 L.09.28 (HS 12)

The ceramic Gas Electron Multiplier — •Amir Tosson and Ivor Fleck for the LCTPC-Deutschland-Collaboration — Siegen University, Siegen, Germany

The Gas Electron Multiplier (GEM) has been proven to fulfill the demands of high energy physics experiments. Effective gain and resistance to the electrical sparks are significant issues to be investigated.

A new type of GEM, made out of ceramic, has been produced and results from measurements with this type of GEM are presented. Advantages of ceramic material are its very good stability versus change in temperature and its electrical properties.

Using $Ar - CO_2(80 - 20\%)$ gas mixture and a X-ray source, the gain of the ceramic GEMs is measured and compared with the one for CERN GEMs. These results assure the possibility of using the ceramic GEMs for high-luminosity experiments. .

T 4.8 Mo 15:50 L.09.28 (HS 12)

The Resistive Plate WELL detector as a single stage Thick Gaseous Multiplier detector — Shikma Bressler[1], Amos Breskin[1], Luca Moleri[1], •Simon Kudella[2], Ashwini Kumar[1] und Michael Pitt[1] — [1]Department of Particle Physics and Astrophysics, Weizmann Institute of Science (WIS) — [2]Institut für Experimentelle Kernphysik (IEKP), KIT

Gaseous Electron Multiplier (GEM) detector use high electric fields inside the hole of a foil to achieve a high charge multiplication. As a thicker version of GEMs based on printed circuit board (PCB) structures, Thick Gaseous Electron Multiplier (THGEM) detectors combine the high gain of a GEM foil with the robustness, stability and low production costs of a PCB and allow a large quantity of applications that require the coverage of a large area at low cost and moderate spatial resolution. One application the Weizmann Institute of Science (WIS) develops as a member of the RD51 framework is the Resistive Plate WELL (RPWELL) detector. This single stage detector allows a very stable, discharge free operation at high gain (10^5). The single stage operation allows a low total height and makes the RPWELL a candidate for the Digital Hadronic Calorimeter (DHCAL) of the International Large Detector (ILD) at the International Linear Collider (ILC). The talk gives an insight into the way the RPWELL works and shows results from the last test beam.