T 72: Postersitzung Teilchenphysik

Zeit: Dienstag 16:45–19:00 Raum: F Foyer

T 72.1 Di 16:45 F Foyer

Reusing events for parameter scans with CheckMATE — Jamie Tattersall and •Frederic Poncza — Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen, Germany

There are now a number of tools on the market that allow models of new physics to be tested against the latest LHC data. These tools fall into two categories, those that perform full event simulation and those that make use of simplified models.

The full event simulation tools have the drawback that they require significant computing power while simplified models are sometimes inaccurate when faced with unfamiliar models or decay chains. We propose a new technique of event transformation that promises the accuracy and generality of full event generation with the speed of simplified models and will be implemented in future versions of CheckMATE.

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ATLAS ITk Silicon Strip Module Production in Dortmund — Silke Altenheiner, Claus Gössling, Reiner Klingenberg, Kevin Kröninger, Jonas Lönker, Daniela Röttges, and •Felix Wizemann — TU Dortmund, Experimentelle Physik IV

To be able to deliver satisfactory tracking performance after the LHC High Luminosity upgrade, the ATLAS inner detector will be replaced during Long Shutdown 3 with a new all-silicon-detector, the Inner Tracker (ITk), featuring pixel and strip sensors.

Modules for the strip endcaps will be produced in Dortmund. One endcap consists out of six disks and each disk will be populated by 32 petals. Each petal will include six different module designs. The necessary preparations for production as well as the assembly and testing of modules will be presented.

T 72.3 Di 16:45 F Foyer

TARGET, An Integrated Readout Electronics for Cherenkov Telescopes — David Jankowsky[1], •Adrian Zink[1], Manuel Kraus[1], Jacky Catalano[1], Manuel Loos[1], Johannes Schäfer[1], Stefan Funk[1], Luigi Tibaldo[2], Gary Varner[3], and the CTA Consortium[4] — [1]Erlangen Centre for Astroparticle Physics (ECAP) — [2]Max-Planck-Institut für Kernphysik, Heidelberg — [3]Department of Physics and Astronomy, University of Hawaii — [4]Full consortium author list at http://cta-observatory.org

TARGET is an Application Specific Integrated Circuit (ASIC) designed for the readout of different photosensors in various types of experiments. The ASIC is capable of sampling at high rates (typically 1 GSamples/s), digitizing with 12-bit precision and to supply trigger information. The small package size, high integration (16 channels/ASIC), deep buffer for trigger latency (16k samples) and low cost per channel make TARGET an excellent candidate for systems with large number of telescopes equipped with a compact silicon and multi-anode photomultipliers, like the Cherenkov Telescope Array (CTA). The TARGET concept and performance studies of the newest generation will be presented.

T 72.4 Di 16:45 F Foyer

Interaction Depth Reconstruction in $(20 \times 20 \times 15)\,\mathrm{mm}^3$ Coplanar-Quad-Grid CdZnTe Detectors — •Robert Temminghoff for the COBRA-Collaboration — Exp. Physik IV, TU Dortmund

The aim of the COBRA collaboration is to use CdZnTe detectors to search for neutrinoless double beta-decay. Currently, COBRA is investigating $(20 \times 20 \times 15)\,\mathrm{mm}^3$ CdZnTe detectors that will be used in the extended demonstrator (XDEM) phase of the experiment. A coplanar-quad-grid (CPqG) read-out is used to capture the charge signal on these detectors. This electrode design allows to overcome the problem of hole trapping in CdZnTe by making use of single-polarity charge sensing achieved by the coplanar-grid. Using four grids on a single detector helps to further improve the spectroscopic performance of the device.

The coplanar-grid also allows to obtain information about the interaction depth of an event, a very powerful tool for COBRA. It allows to veto signals due to contaminations near the electrodes of the detector and thus to achieve a lower background level.

An investigation of the performance of the interaction depth reconstruction of a coplanar-quad-grid detector is shown. A collimated ^{137}Cs-source was used to irradiate the detector at different depths. With this data it is possible to experimentally test the interaction depth reconstruction for coplanar-quad-grid detectors. Furthermore, two different formulas to calculate the interaction depth are compared.

T 72.5 Di 16:45 F Foyer

Tests of final hardware revision of the Belle II PXD data reduction system — •Dennis Getzkow, Wolfgang Kühn, Sören Lange, Thomas Gessler, Klemens Lautenbach, and Simon Reiter — Justus-Liebig-Universität Gießen, II. Physikalisches Institut

The Belle II physics data taking is scheduled in October 2018, with a planned factor ≤ 40 higher luminosity as its predecessor, the Belle experiment. For the pixel detector (PXD) DEPleted Field Effect Transistors (DEPFET) are used, with $\sim 8 \times 10^6$ pixels in total. As increased luminosity implies increased background, online filtering of incomming raw data of ∼20 GB/s is a crucial part of the PXD readout chain. The hardware platform is based upon ATCA (Advanced Telecommunications Architecture), Xilinx Virtex-5 FX70T FPGAs and high speed optical link technology (6.5 Gbps), and called ONline SElection Nodes (ONSEN). The reduction is based on calculated Regions-Of-Interest (ROIs), calculated by a high level trigger running on a PC farm. The full ONSEN system consists of 9 ATCA carrier boards with 33 daughter cards.

Tests procedures for final hardware will be presented.

This work was supported by the Bundesministerium für Bildung und Forschung under grant number 05H15RGKBA.

T 72.6 Di 16:45 F Foyer

Investigations of the KATRIN interspectrometer Penning trap — •Mariia Fedkevych for the KATRIN-Collaboration — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster, Wilhelm-Klemm-Str. 9, 48149 Münster, Germany

The KArlsruhe TRItium Neutrino Experiment is a direct low-background measurement of the neutrino mass from the kinematics of tritium-β-decay aiming for a sensitivity of 0.2 eV/c^2. To analyze energies of electrons, generated in the WGTS (windowless gaseous tritium source), KATRIN uses a pair of electrostatic spectrometers working in MAC-E-filter mode (called pre- and main-spectrometer). In the region between them, a Penning trap is created by the combination of retarding potentials of -18.3 kV in the pre-spectrometer and -18.6 kV in the main spectrometer together with a magnetic field of 4.5 T produced by a common superconducting magnet. Electrons accumulating in this trap can lead to discharges which create additional background and may present a certain danger for spectrometer and detector section of KATRIN. To counteract this problem, so-called *Penning wipers* were designed and implemented in the magnet between two spectrometers. A Penning wiper is a metal rod which can be moved in and out of the electron flux tube to remove trapped particles. In this presentation the general idea and the first test measurements are presented. Results of background measurements with different electric and magnetic field settings will be discussed. This work is supported under BMBF contract number 05A14PMA.

T 72.7 Di 16:45 F Foyer

Chemical purification and a new method to synthezise high purity CaWO4 powder used for CaWO4 crystal production for the CRESST experiment — •Honghanh Trinh Thi[1], Xavier Defay[2], Andreas Erb[3], Rafael Hampf[1], Jean Lanfranchi[1], Alexander Langenkämper[1], Vasily Morgalyuk[1], Andrea Münster[1], Elizabeth Mondragon[1], Corbinian Oppenheimer[1], Walter Potzel[1], Stefan Schönert[1], Hans Steiger[1], Andreas Ulrich[1], Stephan Wawoczny[1], Michael Willers[1], and Andreas Zöller[1] — [1]E15, TUM, 85748 Garching — [2]Excellence Cluster Universe, Garching — [3]Walther-Meißner Institut, Garching

The CRESST experiment (Cryogenic Rare Event Search with Superconducting Thermometers) uses CaWO4 single crystals as targets for the direct search of dark matter particles. For rare event experiments, low intrinsic contaminations of the crystals play a crucial role. Since several years CaWO4 crystals are grown at the Technische Universität München (TUM). Commercially available CaCO3 and WO3 powders are used for the synthesis of CaWO4 powder. In order to improve the radiopurity of the crystals, it is necessary to reduce potential sources of radioactive materials such as U, Th, Sr and Pb in CaWO4 powder. In this poster, we present our studies of the chemical purification of raw materials and a new method to synthesize high purity CaWO4 powder. This research was supported by the DFG cluster of excellence "Origin and Structure of the Universe", Boltzmannstr. 2, 85748 Garching, by the Helmholtz Alliance for Astroparticle Physics, by the Maier-Leibnitz-Laboratorium (Garching) and by the BMBF.

T 72.8 Di 16:45 F Foyer

Geant4 simulations of the XENON1T dual-phase xenon TPC — •Lutz Althüser — IKP, Westfälische Wilhelms-Universität Münster

The XENON Dark Matter Project uses the concept of a dual-phase xenon time projection chamber (TPC) for a direct detection of weakly interacting massive particles (WIMPs). In the current operating step, XENON1T, the sensitivity of the detector will be increased by two orders of magnitude compared to its predecessor XENON100.

Therefore the TPC is build to detect low intensity VUV light signals, generated either directly by the recoil produced by the scattering processes of incoming particles (S1) or through proportional scintillation (S2). The light collection efficiency (LCE) of these signals depends on the position of interaction in the active volume and on the optical properties of the materials. The settings of these MC parameters needs to be obtained from and checked against actual data during the operation.

This poster will focus on the implementation of the XENON1T Geant4 MC and its simulation of the LCE for S1 and S2 signals with regard to several optical parameters like the reflectivity of Teflon and the refraction index of liquid xenon.

This work is supported by BMBF under contract 05A14PM1.

T 72.9 Di 16:45 F Foyer

Recent results of antiproton manipulation in the AE$\bar{g}$IS collaboration — •Ingmari Christa Tietje — Route de Meyrin 385, 1217 Meyrin, Switzerland

In the beginning of the universe same amounts of matter and antimatter were produced from a singularity in energy. Most of the matter annihilated with antimatter immediately and ultimately gave rise to the cosmic background radiation. A small fraction of matter did not annihilate and formed the universe. But why do we observe primordial matter and no primordial antimatter in the universe and which are the reasons for the baryon asymmetry? At the antiproton decelerator (AD) at CERN low-energy antiprotons are provided to a number of different experiments. The collaboration of one of the experiments AE$\bar{g}$IS (Antimatter Experiment: Gravity, Interferometry, Spectroscopy) aims for a test of the weak equivalence principle of antimatter. To approach this goal experimental techniques from different fields are required. One of these fields is plasma physics: A crucial step is to catch and store the negatively charged antiprotons provided by the AD in Penning traps. Through collisions with electrons in a cryogenic environment the antiprotons are sympathetically cooled as low as cryogenic temperatures. Here we present recent results of measurements carried out with antiprotons inside the AE$\bar{g}$IS experimental setup. This comprises results about two-component electron-antiproton plasmas as well as ballistic transfer of antiprotons. The control we possess over the antiprotons enables us to pursue the ultimate goal of AE$\bar{g}$IS - to test the weak equivalence principle with antihydrogen.

T 72.10 Di 16:45 F Foyer

Krypton delayed coincidence and Radon alpha spectrometry analysis at the XENON1T experiment — •Miguel Angel Vargas for the XENON-Collaboration — Institut für Kernphysik, Westfälische Wilhelms-Universität Münster,Münste, Germany

The XENON1T experiment aims at finding direct evidence for dark matter through the scattering of Weakly Interacting Massive Particles (WIMPs) with target nuclei in an ultra-low background dual-phase xenon Time Projection Chamber (TPC) based detector. The detector employs about 3.3 tons of liquid xenon in order to reach a projected sensitivity of 2×10^{-47} cm^2 for a WIMP mass of 50 GeV/C^2.

Among the most threatening sources to this sensitivity are those from radioactive background such as ^{85}Kr and radon isotopes, which are dispersed inside the entire liquid target and cannot be reduced by making use of the self-shielding properties of xenon. Thus, the importance in understanding these intrinsic contaminants is crucial to ensure the background interpretation of the experiment along to be able to monitor their removal.

This poster focuses on obtaining a coherent picture of these intrinsic radioactive backgrounds by using a delayed coincidence technique for ^{85}Kr,which has a beta-decay with an endpoint energy of 687 keV, and by reconstructing ^{222}Rn or ^{220}Rn subsequent decay products through alpha decay analysis (alpha spectrometry reconstruction)

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The nEXO light detection system and photo-detector characterization efforts — •Michael Wagenpfeil, Patrick Hufschmidt, Ako Jamil, Judith Schneider, Tobias Ziegler, Gisela Anton, Jürgen Hössl, and Thilo Michel — ECAP, Friedrich-Alexander-Universität Erlangen-Nürnberg

The nEXO experiment is a planned 5-tonne LXe TPC designed for the search for the neutrinoless double beta decay of ^{136}Xe. In order to reach the prospected half-life of up to 10^{28} years a good energy resolution of 1% (sigma) at the Q-value (2457.8 keV) and a good background suppression is crucial resulting in strong requirements on the collection efficiency of the VUV scintillation photons produced by any events in the LXe. The light detection system needs to be designed accordingly.

nEXO will use large area VUV-sensitive SiPMs as photo detectors covering the lateral surface of the cylindric TPC. Their instrinsic properties such as the photo detection efficieny (PDE) or number of events suffering correlated avalanches (such as Crosstalk and Afterpulsing) as well as the general layout of the nEXO TPC needs to be optimized to meet the requirements on the light detection system. For example, the PDE of any SiPM candidates needs to be at least 15% for LXe scintillation light ($\lambda = 175\,\mathrm{nm}$) to detect at least 7% of the overall scintillation light of a given event.

We report current aspects of the nEXO light detection system and characterization results of trending VUV-sensitive SiPMs examined by different collaboration members focussing on their performance at LXe temperatures.

T 72.12 Di 16:45 F Foyer

Investigation on position reconstruction at the edges of the EXO-200 TPC — •Sebastian Schmidt, Gerrit Wrede, Gisela Anton, Jürgen Hössl, and Thilo Michel — Erlangen Centre for Astroparticle Physics (ECAP), Friedrich-Alexander-Universität Erlangen-Nürnberg, Erwin-Rommel-Str. 1, 91058 Erlangen

EXO-200 is an experiment searching for the neutrinoless double beta decay of Xe-136 using a TPC filled with enriched liquid xenon.

Events taking place in the bulk liquid lead to the emergence of scintillation light with a wavelength in the vacuum ultraviolet band and free charge in the form of electrons. The light and charge signals are used to determine the energy of an event. The position is reconstructed with the charge signal only.

A larger mass of the fiducial volume increases the sensitivity of the experiment. To improve this, further investigations of effects close to the border of the TPC are made in order to include events in this region and to extend the active volume as a consequence.

In this contribution we present our analysis of the standoff distance distribution - the shortest distance of an event vertex to the inner boundary of the TPC - for Monte Carlo data and compare the results to real data.

Additionally, a drift simulation of electrons in the TPC is used to get a better agreement of Monte Carlo and data taken by the experiment in order to eventually improve the detector sensitivity.