T 68: Poster

Zeit: Dienstag 16:45–19:00 Raum: ReWi EG

T 68.1 Di 16:45 ReWi EG

Atomic Parity Violation measurement in a single trap Ra+ ion to determine the Weinberg angle — •Mayerlin Nunez Portela, Elwin A. Dijck, Amita Mohanty, Nivedya Valappol, Oliver Boell, Klaus Jungmann, Cornelis J. G Onderwater, Sophie Schlesser, Rob G. E. Timmermans, Lorenz Wilmann, and Hans W. Wilschut — University of Groningen, FWN, Zernikelaan 25, NL-9747AA Groningen

A single trapped Ra^+ ion is excellently suited for a precision measurement of the Weinberg mixing angle at low momentum transfer and thereby testing the electroweak running. Sensitivity exists also to dark matter. The absolute frequencies of the atomic transition $7s^2S_{1/2}$-$7d^2D_{3/2}$ at wavelength 828 nm has been determined in $^{212-214}Ra^+$ to better than 19 MHz with laser spectroscopy on small samples of ions trapped in a linear Paul trap. The upcoming measurement of the Weinberg angle ($\sin^2\Theta_W$) requires the localization of one single ion of Ra^+ within a fraction of an optical wavelength. Current experiments are focused on trapping and on laser spectroscopy in a single Ba+ ion as a precursor for Ra^+. Work towards single ion trapping of Ra^+, including the preparation of an offline ^{223}Ra source is in progress. Most elements requiered for the parity measurement in single Ra^+ ion are also well suited for utilization as a most stable optical clock.

T 68.2 Di 16:45 ReWi EG

Simulation of a Compton-Telescope with a liquid Xenon-TPC — •Frank Steinke, Cyril Grignon, and Uwe Oberlack — Johannes Gutenberg-Universität Mainz

MeV gamma-ray astrophysics provides a little explored window into an energy regime which promises a multitude of new insights. It comprises gamma-ray bursts, MeV blazars, or extragalactic background radiation in the continuum, and it is the energy regime of positron annihilation and nuclear transitions. Gamma-ray lines from isotopes such as ^{56}Ni, ^{44}Ti, ^{26}Al or ^{60}Fe can provide unique insights into, e.g., the inner workings of supernova explosions and ongoing nucleosynthesis. Compton scattering is the dominant interaction in this energy range, making a Compton telescope the most promising detector principle. Here we present a Monte Carlo study of a combination of Si pixels as scatter detector and a liquid xenon TPC as position-sensitive calorimeter.

T 68.3 Di 16:45 ReWi EG

First tests for an experiment on quantum entanglement of ultra-relativistic electrons at the S-DALINAC — •Steffen Schlemme[1], Kazimierz Bodek[2], Pawel Caban[3], Jacek Ciborowski[4], Joachim Enders[1], Adam Kozela[5], Marcin Perkowski[2], Michal Rawlik[2], Jakub Rembielinski[3], Dagmara Rozpedzik[2], Damian Trybek[2], Marta Wlodarczyk[4], and Jacek Zejma[2] — [1]TU Darmstadt — [2]Jagiellonian University Krakow — [3]University of Lodz — [4]University of Warsaw — [5]Polish Academy of Science, Krakow

Quantum entanglement is a current topic of quantum information theory, and experimental studies for massless photons as well as massive particles have been carried out, showing the limits of local realism. No data exist for relativistic fermions, and theoretical predictions suggest that spin correlations are ambiguous and difficult to interpret in this case. Therefore we aim at measuring an electron-pair spin-correlation function at the superconducting Darmstadt electron linear accelerator S-DALINAC using the now available polarized beam. Entangled relativistic electron pairs will be formed in Moeller scattering at 15 MeV beam energy, and polarization will be measured in backward-angle Mott scattering [1]. Results of a first test experiment on background conditions and event rates will be presented.

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[1] K. Bodek et al., AIP Conference Proceedings 1563, 208 (2013).

T 68.4 Di 16:45 ReWi EG

Design of a gas system and study of internal calibration sources for liquid Xenon-TPCs. — •Christopher Hils, Rainer Othegraven, and Uwe Oberlack — Johannes Gutenberg Universität Mainz

Future dark matter detectors based on the principle of a two-phase liquid xenon time-projection chamber, such as XENON1T or DARWIN require increasing use of internal calibration sources. Also the study of the low-energy response of liquid xenon, as planned with the MainzTPC requires good calibration points. We discuss the design and construction of a xenon gas system which allows the injection of trace calibration gases into the TPC. Moreover, we discuss trace gases currently in use and focus on ^{37}Ar, produced at the Mainz TRIGA reactor, as a low energy calibration point at 2.38 keV.

T 68.5 Di 16:45 ReWi EG

Discharge probability studies in GEM detectors for the ALICE TPC upgrade — •Jacopo Margutti for the ALICE TPC-Collaboration — TU München, Boltzmannstr. 2, 85748 Garching, Germany

The ALICE experiment at CERN is planning a major upgrade of its Time Projection Chamber (TPC) for the upcoming RUN 3 at LHC. The TPC now uses Multi-Wire Proportional Chambers (MWPCs) with pad readout to amplify and read out the signal. A gating grid is necessary to prevent the ions created in the amplification process to flow back into the drift volume, which would eventually lead to distortions of the reconstructed tracks. The gating limits the TPC readout rate to around 3 kHz, whereas for RUN 3 Pb-Pb collision rates of 50 kHz are expected. We are therefore planning to substitute the MWPCs whit Gas Electron Multiplier (GEM) detectors, which feature an intrinsic suppression of the ion back-flow, allowing to operate in a continuous, trigger-less readout mode. A common issue with micro-pattern gas amplification, such as GEM, is stability against discharges, that are thought to be triggered by events with high local charge-density. We will present the results of the stability tests carried out on a prototype of GEM Inner ReadOut Chamber (GEM-IROC) with highly ionizing particles, i.e. low energy protons. We will also present results from a parallel R&D program on smaller prototypes which aims to understand the influence of gas mixture and field configuration on discharges inside multi-GEMs detectors. This work is supported by BMBF and DFG Cluster of Excellence ”Universe” (Exc 153).

T 68.6 Di 16:45 ReWi EG

Direct search for ultralight non-baryonic dark matter with WISP Dark Matter eXperiment (WISPDMX) — •Sebastian Baum[1], Babette Döbrich[2], Dieter Horns[1], Joerg Jaeckel[3], Reinhard Keller[4], Denis Kostin[2], Michael Kramer[4], Axel Lindner[4], Andrei Lobanov[4,1], Christof Mangels[1], Wolf-Dietrich Möller[2], Javier Redondo[5,6], Andreas Ringwald[2], Jacek Sekutowicz[2], Alexey Sulimov[2], Dieter Trines[2], and Alexander Westphal[2] — [1]Institut für Experimentalphysik, Universität Hamburg,Deutschland — [2]Deutsches Elektronen Synchrotron DESY, Hamburg, Deutshcland — [3]Institut für Theoretische Physik, Universität Heidelberg, Deutschland — [4]Max-Planck-Institut für Radioastronomie, Bonn, Deutschland — [5]Ludwig-Maximilians-Universität, München, Deutschland — [6]Max-Planck-Institut für Physik, München, Deutschland

A growing number of theoretical and observational arguments suggest that dark matter (DM) can be explained with new, ultralight particles such as axions or hidden photons, particularly if their masses are in the 0.1-1000 μeV range. The microwave cavity experiment WISPDMX expands the hidden photon and axion dark matter searches into the 0.8-2 μeV range. The first stage of WISPDMX measurements constrains the kinetic mixing angle of hidden photons to $0.5\text{-}2\cdot10^{-12}$, reaching well into the parameter space preferred for DM. The second and third stages of WISPDMX will probe up to 70 percents of the 0.8-2 μeV range and extend the searches also to the axion particle.