T 31: Neutrinophysik mit Beschleunigern

Zeit: Freitag 9:20–10:30 Raum: ZHG 105

Gruppenbericht T 31.1 Fr 9:20 ZHG 105

The OPERA Experiment – Neutrino Oscillation Search — •Annika Hollnagel for the OPERA-Hamburg-Collaboration — Universität Hamburg, Institut für Experimentalphysik, Luruper Chaussee 149, 22761, Hamburg

The primary goal of the OPERA long-baseline neutrino oscillation experiment is the first direct detection of $\nu_\mu \rightarrow \nu_\tau$ oscillations.
The hybrid OPERA detector consists of a target made from lead and photo emulsions, providing micrometric resolution, and electronic detector parts for on-line readout. It is located in the LNGS underground laboratory, at a baseline of 730 km from the SPS at CERN, where the ν_μ CNGS beam is produced.
The measurement of ν_τ appearance relies on the detection of the decay of τ leptons which are created in ν_τ charged current reactions. Data acquisition started in 2008, and numerous beam-induced events have been recorded, including the observation of a first ν_τ candidate event in 2009.
In this talk, the current status of the oscillation analysis will be presented.

Gruppenbericht T 31.2 Fr 9:40 ZHG 105

The OPERA Neutrino Velocity Measurement: Analysis details — •Torben Ferber for the OPERA-Hamburg-Collaboration — Universität Hamburg, Luruper Chausse 149, 22761 Hamburg

The OPERA neutrino experiment at the underground Gran Sasso Laboratory has measured the velocity of neutrinos from the CERN CNGS beam over a baseline of about 730 km. An early arrival time of CNGS muon neutrinos with respect to the one computed assuming the speed of light in vacuum was measured. Details on the statistical analysis of the nominal beam data sample and the short–bunch analysis as well as additional cross checks and an outlook of upcoming measurements are discussed.

T 31.3 Fr 10:00 ZHG 105

Diskriminierung von NC π^0 Ereignissen im Flüssigszintillatordetektor LENA — Sebastian Lorenz, •Daniel Bick, Caren Hagner, Markus Kaiser, Björn Wonsak und Michael Wurm — für die LENA Arbeitsgruppe - Universität Hamburg, Institut für Experimentalphysik, Luruper Chaussee 149, 22761 Hamburg

Die europäische Designstudie LAGUNA-LBNO beschäftigt sich mit der Planung eines zukünftigen Untergrund-Neutrinoobservatoriums, in der der 50 kt Flüssigszintillatordetektor LENA (Low Energy Neutrino Astronomy) eine mögliche Option darstellt. Im Rahmen der Studie soll u. a. die Verwendungsmöglichkeit des Detektors zur Untersuchung von Long-Baseline-Neutrinooszillationen evaluiert werden. Über die $\nu_\mu \rightarrow \nu_e$ Oszillation in einem Neutrinostrahl sollen dabei Informationen zu den Mischungsparametern θ_{13} und δ_{CP} sowie zur Massenhierarchie gesammelt werden. Trotz der isotropen Lichtemission in Flüssigszintillatoren zeigen erste Studien, dass die Rekonstruktion von Neutrinovertices im GeV-Bereich möglich ist. Darüber hinaus entscheidend für eine präzise Messung der Neutrinomischungsparameter ist die Diskriminierung von NC Ereignissen, in denen einzelne neutrale Pionen erzeugt werden, die daraufhin in zwei Gammaquanten zerfallen. Diese müssen vom Elektron aus dem CC ν_e-Appearance-Kanal unterschieden werden. Im Rahmen einer Diplomarbeit wurden erste Monte-Carlo-Studien zur Diskriminierung der beiden Ereignistypen durch eine multivariate Analyse mit Boosted Decision Trees bis zu einer Energie von 1 GeV durchgeführt. Die ermutigenden Resultate sollen in diesem Vortrag vorgestellt werden.

T 31.4 Fr 10:15 ZHG 105

Track reconstruction in unsegmented liquid scintillator detectors — •Dominikus Hellgartner — for the LENA working group — Technische Universität München, Physik Department E15, James Franck Straße, 85748 Garching

Liquid scintillator detectors, like the proposed 50 kt LENA (**L**ow **E**nergy **N**eutrino **A**stronomy) detector, are generally known for their low energy threshold and their high energy resolution. Just recently, it was realized that, despite the isotropic light emission, a reconstruction of lepton tracks with energies above a few 100 MeV is possible in liquid scintillator detectors by exploiting the arrival times of the photons.

Thus a reconstruction for electron and muon tracks was developed. It utilizes a likelihood fit to the integrated charge and the arrival time of the first detected photon at each PMT. Monte Carlo simulations indicate, that with this method, a vertex resolution between 2 and 7 cm, an angular resolution from 1.5 to 5 degrees and an energy resolution of about 0.5% can be achieved in the sub-GeV energy range. The reconstruction was extended to include point-like vertices. Using simulated β-beam events, the energy threshold for muon-track reconstruction was found to be around 200 MeV. Currently there is ongoing work to extend the track reconstruction to higher energies and more complex event topologies.

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