HK 65: Plenary VII

Time: Thursday 9:00–10:30 Location: Audi-Max

Invited Talk HK 65.1 Th 9:00 Audi-Max

Hypernuclear Physics — •Tullio Bressani for the FINUDA-Collaboration — Dipartimento di Fisica Sperimentale Torino, Torino Italy — I.N.F.N., Sezione di Torino, Italy

Hypernuclear Physics, born more than fifty years ago, is experiencing today a strong boost both from the experimental and theoretical sides. This is due mainly to the operation, in the last decade, of powerful detectors that allowed a substantial step forward on many aspects, showing interesting and sometimes unexpected phenomena. In the contribution the latest experimental results will be presented and discussed. For Hypernuclear Spectroscopy they are the good mapping of the level structure of p-shell Hypernuclei by Gamma Ray Spectroscopy, that allowed for the first time the extraction of the parameters of the Lambda-Nucleon interaction and the clear evidence for core excited states by high resolution magnetic spectrometry. For Weak Decays they are the first measurement of the negative pion spectra from mesonic decay and the first high resolution measurement of the proton spectra from non-mesonic decays. This last measurement allowed to confirm the importance of the Lambda-two nucleons weak interactions. This observation is perhaps linked to the observation of the large contribution of multi-nucleon processes in K- absorption at rest by nuclei. An outlook to future facilities will finally be given.

Invited Talk HK 65.2 Th 9:30 Audi-Max

Neutrino Mass and Oscillations — •Christian Weinheimer — Institut für Kernphysik, University of Münster, Germany

Experiments with atmospheric, solar, reactor and accelerator neutrinos have clearly demonstrated, that neutrinos from one flavor eigenstate can oscillate into another flavor eigenstate on the way from the neutrino source to the detector. Recently, new evidence came from the experiments BOREXINO with solar neutrinos and from MINOS with accelerator neutrinos. The origin of these neutrino oscillations are non-zero neutrino masses and non-trivial neutrino mixings, similar to the quark mixing described by the CKM-matrix. These neutrino properties beyond the Standard Model of particle physics do not play only an important role in nuclear and particle physics (e.g. in differentiation between theories beyond the Standard Model) but also in astrophysics (e.g. in super novae explosions) and cosmology (e.g. in structure formation). Two out of three neutrino mixing angles are determined to be maximum or large, respectively. Currently, one main focus is, whether the third mixing angle θ_{13} is non-zero, which allows CP violation in the lepton sector. The other main focus is the determination of the neutrino mass scale. Since oscillation experiments can only determine differences between squared neutrino masses, this has to be done by direct neutrino mass experiments (KATRIN, MARE) or the search for the neutrinoless double beta decay (e.g. GERDA, CUORE, NEMO). In this talk the recent results from neutrino oscillation experiments and the status of direct neutrino mass and neutrinoless double beta decay experiments will be presented.

Invited Talk HK 65.3 Th 10:00 Audi-Max

The QCD phase diagram from lattice simulations — •Owe Philipsen — Institut für Theoretische Physik, Universität Münster, Germany

The QCD phase diagram tells us the different forms in which nuclear matter exists as a function of temperature and baryon chemical potential, as well as the location of phase transitions between them. Because of the so-called sign problem of lattice QCD, first principles calculations at finite baryon chemical potential are impossible and simulations have to use detours which are valid for small densities only. I review recent simulation results. Because of strong discretization effects, it is not yet possible to draw conclusions for the continuum phase diagram.