T 71: Eingeladene Vorträge III

Zeit: Donnerstag 14:00–16:00 Raum: Z6 - HS 0.001

Eingeladener Vortrag T 71.1 Do 14:00 Z6 - HS 0.001
Radio detection of cosmic rays – achievements and future potential — •Tim Huege — Karlsruher Institut für Technologie, Institut für Kernphysik, Postfach 3640, 76021 Karlsruhe, Germany — Vrije Universiteit Brussel, Pleinlaan 2, 1050 Brussel, Belgium

When modern efforts for radio detection of cosmic rays started more than a decade ago, hopes were high but the true potential was unclear. Since then, we have achieved a detailed understanding of the radio-emission physics and have consequently succeeded in developing sophisticated detection schemes and analysis approaches. In particular, we have demonstrated that the important air-shower parameters arrival direction, particle energy and depth of shower maximum can be reconstructed reliably from radio measurements, with a precision that is competitive with that of other detection techniques. In this talk I will review the achievements of the radio detection technique and discuss the potential for future application in existing and new experiments.

Eingeladener Vortrag T 71.2 Do 14:24 Z6 - HS 0.001
Prospects and Techniques of Surface Detector Extensions for IceCube — •Jan Auffenberg for the IceCube-Gen2-Collaboration — III. Physikalisches Institut B, RWTH Aachen University

The discovery of astrophysical neutrinos up to PeV energies by the IceCube Observatory has triggered intense interest in identifying their origin. Therefore, to improve IceCube's neutrino detection- and overall capabilities, IceCube-Gen2 is planned. For neutrino astronomy, a large background-free sample of well-reconstructed astrophysical neutrinos is essential. The main background for this signal are muons and neutrinos which are produced in cosmic-ray air showers in the Earth's atmosphere. The coincident detection of these air showers by the surface detector IceTop has been proven to be a veto for atmospheric neutrinos and muons in the field of view of the Southern Hemisphere. This motivates a large extension of IceTop to more efficiently detect cosmic rays. In addition, the measurement of different signal channels of air showers is a powerful tool to improve gamma ray detection and cosmic ray composition studies with IceCube. The different channels can be: the high energy muon detection by IceCube deep in the ice, the particle detection on the surface, air Cherenkov light detection, or radio signals of air showers. A selection of technologies, like the usage of imaging air Cherenkov telescopes, IceAct, radio signal detection of air showers, or particle detection with scintillator paddles is discussed.

Eingeladener Vortrag T 71.3 Do 14:48 Z6 - HS 0.001
UHECR propagation: interactions and secondary messengers — •Denise Boncioli — DESY, Platanenallee 6, 15738 Zeuthen

Ultra high energy cosmic rays (UHECRs) are accelerated in astrophysical sources and travel through the extragalactic space before hitting the Earth atmosphere. They interact both with the environment in the source and with the intergalactic photon fields they encounter, causing different processes at various scales depending on the photon energy in the nucleus rest frame. The general implications of the situation of nuclear measurements for cosmic ray astrophysics will be discussed, from the point of view of the propagation and of the candidate sources of cosmic rays. The sensitivity of the UHECR observables and of the secondary messengers like neutrinos and photons to uncertainties in the extragalactic background light and photo-disintegration models will be also described. The possibility of using secondary messengers as a powerful tool to unveil the UHECR sources will be also pointed out.

Eingeladener Vortrag T 71.4 Do 15:12 Z6 - HS 0.001
SQUID readout for microcalorimeter based neutrino experiments — •Sebastian Kempf — Kirchhoff-Institute for Physics, Heidelberg University, Im Neuenheimer Feld 227, 69120 Heidelberg, Germany.

Neutrino physics has been always a strong driving force for the development of low-temperature microcalorimeters. The latter are presently used in a variety of experiments such as direct neutrino mass investigations or searches for the neutrinoless double beta decay. A famous example is the Electron capture in Ho-163 experiment ECHo which aims to investigate the electron neutrino mass by means of a calorimetric measurement of the ^{163}Ho electron capture spectrum using large metallic magnetic calorimeter arrays. Most of these microcalorimeter based experiments rely on the existence of ultra-low noise signal transducers converting the detector output signal into a voltage pulse. Superconducting quantum interference devices (SQUIDs) are often the devices of choice since they are intrinsically compatible with the microcalorimeter operation temperature, show a near quantum-limited noise performance and offer a very high system bandwidth.

This talk will give a short introduction into metallic magnetic calorimeter based neutrino physics experiments such as ECHo. It will then concentrate on the development of single-channel SQUIDs for experiments using only a small number of readout channels as well as frequency-domain multiplexed SQUID systems for next-generation large-scale experiments requiring tens or hundreds of thousands of individual detectors.

Eingeladener Vortrag T 71.5 Do 15:36 Z6 - HS 0.001
Radio detection of cosmogenic neutrinos in the Antarctic Ice — •Anna Nelles — DESY, 15738 Zeuthen, Germany — University of California, Irvine, CA 92617, USA

Measuring neutrinos of energies of more than 10^{16} eV will be an important step towards finding the origin of ultra-high energy cosmic rays. The interaction of cosmic rays with the cosmic microwave background and matter surrounding the sources will create an inevitable but low neutrino flux that mostly depends on source evolution and composition. The most promising technique to detect these neutrinos is based on radio emission. Particle showers generated by neutrinos create a short nanosecond-scale radio pulse, which can be measured at large distances in radio transparent media such as ice. The attenuation length of usually more than 500 meters allows for the construction of large arrays at modest costs. In order to effectively detect neutrinos at the relevant energies, effective volumes two orders of magnitude larger than current detectors are needed. Also, analysis methods have to be developed, of which many can built on the success of radio detection of air showers. I will elaborate on recent results of pilot stage arrays in Antarctica and discuss the way forward.