# T 17: Neutrinoastronomie I

Zeit: Montag 11:00–12:35 Raum: VMP9 SR 08

**Gruppenbericht** T 17.1 Mo 11:00 VMP9 SR 08
**IceCube Gen2: the next-generation neutrino observatory for the South Pole** — •Jakob van Santen for the IceCube-Collaboration — DESY, Zeuthen

The IceCube Neutrino Observatory is a cubic-kilometer Cherenkov telescope buried in the ice sheet at the South Pole that detects neutrinos of all flavors with energies from tens of GeV to several PeV. The instrument provided the first measurement of the flux of high-energy astrophysical neutrinos, opening a new window to the TeV universe. At the other end of its sensitivity range, IceCube has provided precision measurements of neutrino oscillation parameters that are competitive with dedicated accelerator-based experiments.

Here we will present design studies for IceCube Gen2, the next-generation neutrino observatory for the South Pole. Instrumenting a volume of more that 5 km$^3$ with over 100 new strings, IceCube Gen2 will have substantially greater sensitivity to high-energy neutrinos than current-generation instruments. PINGU, a dense infill array, will lower the energy threshold of the inner detector region to 4 GeV, allowing a determination of the neutrino mass hierarchy. On the surface, a large air shower detector will veto high-energy atmospheric muons and neutrinos from the southern hemisphere, enhancing the reach of astrophysical neutrino searches. With its versatile instrumentation, the IceCube Gen2 facility will allow us to explore the neutrino sky with unprecedented sensitivity, providing new constraints on the sources of the highest-energy cosmic rays, and yield precision data on the mixing and mass ordering of neutrinos.

T 17.2 Mo 11:20 VMP9 SR 08
**Search for sterile neutrinos with IceCube DeepCore** — •Andrii Terliuk for the IceCube-Collaboration — DESY, Platanenallee 6, 15738 Zeuthen, Germany

The DeepCore detector is a sub-array of the IceCube Neutrino Observatory that lowers the energy threshold for neutrino detection down to approximately 10 GeV. DeepCore is used for a variety of studies including atmospheric neutrino oscillations. The standard three-neutrino oscillation paradigm is tested using the DeepCore detector by searching for an additional light, sterile neutrino with a mass on the order of 1 eV. Sterile neutrinos do not interact with the ordinary matter, however they can be mixed with the three active neutrino states. Such mixture changes the picture of standard neutrino oscillations for atmospheric neutrinos with energies below 100 GeV. The capabilities of DeepCore detector to measure such sterile neutrino mixing will be presented in this talk.

T 17.3 Mo 11:35 VMP9 SR 08
**A Readout System for the Wavelength-shifting Optical Module** — •Carl-Christian Fösig and Sebastian Böser for the IceCube-Collaboration — Johannes Gutenberg-Universität, Mainz

The success of IceCube and the plans for an IceCube-Gen2 stimulate the development of new photo sensors. The approach of the Wavelength-shifting Optical Module is to provide a device which has a low dark noise rate combined with a high detection efficiency. A small PMT is used to detect red shifted photons guided in a coated PMMA tube, originally emitted by a wavelength shifting coating that absorbs photons in the UV Region. We have studied several PMTs for their usability with the IceCube-Gen2 readout system. Relevant parameters are the pulse widths in relation to the bandwidth of the IceCube-Gen2 readout electronics and the dark noise rates.

T 17.4 Mo 11:50 VMP9 SR 08
**Simulation studies of the Wavelength-shifting Optical Module** — •Vincenzo Di Lorenzo, Esther Del Pino Rosendo, and Sebastian Böser for the IceCube-Collaboration — Johannes Gutenberg-Universität, Mainz, Germany

The Wavelength-shifting Optical Module (WOM) is a concept for a photon sensor developed for the next generation of the IceCube experiment. The large sensitivity area in combination with the high photon detection efficency, in particular in the UV region, as well as the low dark noise rates are prominent features of this sensor. A prototype of the WOM is being developed and shows promising results, but some questions are still open. We present here results from a Geant4 simulation used to study the light propagation inside the WOM and the principle reasons of light loss during photon propagation. Using this simulation, it is possible to reproduce the dominant physical effects inside the tube and correlate the simulated results with the experimental ones.

T 17.5 Mo 12:05 VMP9 SR 08
**Simulation of an extended surface detector IceVeto for IceCube-Gen2** — •Tim Hansmann, Jan Auffenberg, Christian Haack, Bengt Hansmann, Julian Kemp, Richard Konietz, Jakob Leuner, Leif Rädel, Martin Stahlberg, Sebastian Schoenen, and Christopher Wiebusch for the IceCube-Collaboration — III. Physikalisches Institut B, RWTH Aachen University

IceCube is a neutrino observatory located at the geographic South Pole. The main backgrounds for IceCube's primary goal, the easurement of astrophysical neutrinos, are muons and neutrinos from cosmic-ray air showers in the Earth's atmosphere. Strong supression of these backgrounds from the Southern hemisphere has been demonstrated by coincident detection of these air showers with the IceTop surface detector. For an extended instrument, IceCube-Gen2, it is considered to build an enlarged surface array, IceVeto, that will improve the detection capabilities of coincident air showers. We will present simulation studies to estimate the IceVeto capabilities to optimize the IceCube-Gen2 design.

T 17.6 Mo 12:20 VMP9 SR 08
**Status and Performance of the Wavelength-shifting Optical Module for In-Ice Neutrino Detectors** — •Dustin Hebecker — HU-Berlin / DESY

The Wavelength-shifting Optical Module is a single-photon sensor that employs wavelength-shifting and light-guiding techniques to maximize the collection area while minimizing the dark noise rate. The sensor is tailored towards application in ice-Cherenkov neutrino detectors, such as IceCube-Gen2 or MICA. It is aimed at decreasing the energy threshold as well as increasing the energy resolution and the vetoing capability of the neutrino telescope, when compared to a setup with optical sensors similar to those used in IceCube. The proposed sensor captures photons with wavelengths between 250 nm and 400 nm. These photons are re-emitted with wavelengths above 400 nm by a wavelength shifter coating applied to a 90 mm diameter polymer tube. This tube guides the light towards a small-diameter PMT via total internal reflection. As a core component the wavelength shifting and light guiding inner tubes performance has been investigated with multiple methods that will be presented. Furthermore the status of the whole prototype development and its performance will be discussed.