T 64: Neutrino Astronomy III

Time: Wednesday 15:50–17:20 Location: POT/0051

T 64.1 Wed 15:50 POT/0051

KM3NeT status — •Alba Domi for the ANTARES-KM3NET-ERLANGEN-Collaboration — ECAP, Erlangen, Germany

KM3NeT is an underwater neutrino telescope under construction in the Mediterranean Sea. It is divided into two subdetectors: ORCA, whose main goal is the determination of the neutrino mass ordering, is optimised for neutrino oscillation studies in the GeV energy range and it is located 40 km off-shore Toulon (France), and ARCA, located 100 km off-shore Portopalo di Capopassero (Italy), is optimised for cosmic neutrino studies up to the PeV energy range. The construction and deployment of the telescope is modular and, to date, a fraction of the planned detection units is already taking data. This talk reviews the status of the KM3NeT neutrino telescope, and it presents the first analyses performed with collected data.

T 64.2 Wed 16:05 POT/0051

Exploring Prospects for Multi-Messenger Observations of Short Gamma-Ray Bursts with IceCube-Gen2 and the Einstein Telescope — •Sharif El Mentawi[1], Jakob Böttcher[1], Anna Franckowiak[2], Philipp Fürst[1], Erik Ganster[1], Lasse Halve[1], Xavier Rodrigues[2], Matthias Thiesmeyer[1], and Christopher Wiebusch[1] for the IceCube-Collaboration — [1]III. Physikalisches Institut B, RWTH Aachen University — [2]Astronomisches Institut (AIRUB), Ruhr-Universität Bochum

After the coincident observation of a short gamma-ray burst (sGRB) in gamma rays and a neutron star binary merger in gravitational waves in 2017, sGRBs have become one of the most prominent sources for multi-messenger astronomy. Whereas photons provide insight into some of the radiative processes taking place in sGRBs and gravitational waves reproduce kinematics of progenitor neutron stars, neutrinos can traverse dense material and thus might probe the source environment or the merger process itself. With the new generation of multi-messenger experiments, such as IceCube-Gen2 for high-energy neutrinos and the Einstein Telescope for gravitational waves on our doorsteps, the sensitivity to both messengers will be greatly improved. We discuss a data-motivated simulation of sGRBs in neutrinos and gravitational waves, with the goal of estimating joint detection prospects with IceCube-Gen2 and the Einstein Telescope.

T 64.3 Wed 16:20 POT/0051

Investigations of hadronic vs electromagnetic cascade identification at the PeV energy scale. — •Yara Darras for the ANTARES-KM3NET-ERLANGEN-Collaboration — Nikolaus-Fiebiger-Str. 2 91058 Erlangen, Germany

KM3NeT/ARCA is an underwater Cherenkov detector located 100 km off-shore Portopalo di Capo Passero on the south-eastern coast of Sicily. Its main goal is the detection of high energy neutrinos from astrophysical sources such as gamma ray bursts or active galactic nuclei. Neutrino interactions with matter are detected as events of different topologies depending on the neutrino flavour and interaction type. The Glashow resonance is a particular type of neutrino interaction in which an electron antineutrino with an energy of about 6.3 PeV interacts with an electron producing a W-boson which can decay through different channels. In this contribution, the use of deep learning techniques to distinguish between hadronic and leptonic decay modes of the W boson produced in the Glashow resonance is described.

T 64.4 Wed 16:35 POT/0051

Optimization of the Forward-Folding Likelihood Fit for the Astrophysical Muon Neutrino Analysis with IceCube — •Matthias Thiesmeyer[1], Jakob Böttcher[1], Shuyang Deng[1], Philipp Fürst[1], Erik Ganster[1], Jonas Hellrung[1], Sharif El Mentawi[1], Richard Naab[2], and Christopher Wiebusch[1] for the IceCube-Collaboration — [1]III. Physikalisches Institut B, RWTH Aachen University — [2]DESY, Zeuthen, Germany

One important detection channel for astrophysical neutrinos in IceCube is neutrino-induced muon tracks. The astrophysical flux parameters are estimated using a explicit forward-folding likelihood fit of the measured neutrino data. Here, the binned distribution of reconstructed zenith and energy is compared to the number of expected events from atmospheric and astrophysical neutrino fluxes by means of a profile likelihood. To maximize the sensitivity to the astrophysical neutrino flux properties we optimize and generalize the choice of binning. A particular challenge is limited Monte-Carlo statistics for the estimation of precise templates over the full parameter space. As an optimization metric we extend the simple Poissonian likelihood to an effective likelihood that includes the uncertainties of the bin predictions caused by limited Monte-Carlo statistics. By this we can balance between a limited measurement resolution in cases where the binning is too coarse, and a higher statistical uncertainty of the bin predictions in cases where the binning is too fine.

T 64.5 Wed 16:50 POT/0051

Search for collider neutrinos with FASER — Florian Bernlochner, Tobias Blesgen, •Tobias Böckh, Jochen Dingfelder, and Markus Prim — Physikalisches Institut der Rheinischen Friedrich-Wilhelms-Universität Bonn

Although neutrinos are produced in large numbers at the LHC, such collider neutrinos have not been discovered yet since they interact weakly and neutrinos with high energies are dominantly produced along the beamline. Therefore FASER, the forward search experiment, is located on the beam collision axis line-of-sight 480m downstream from the ATLAS interaction point. In this talk, we will present the search for such collider neutrinos using the electronic detectors of the FASER detector.

T 64.6 Wed 17:05 POT/0051

ANNIE: The Accelerator Neutrino Neutron Interaction Experiment — •Marc Breisch for the ANNIE-Collaboration — Physikalisches Institut, Eberhard Karls Universität Tübingen

The Accelerator Neutrino Neutron Interaction Experiment (ANNIE) is a 26-ton gadolinium doped water Cherenkov detector on-axis of the Booster Neutrino Beam (BNB) at FermiLab. Its primary goal is to measure the final state neutron multiplicity of neutrino-nucleus interactions to improve the systematic uncertainties of next-generation long baseline neutrino experiments. An additional milestone will be the deployment of multiple Large Area Picosecond Photodetectors (LAPPD), of which the first one is already commissioned and deployed. These novel detectors feature a timing resolution less than 100 picoseconds and a sub-centimeter spatial resolution, thus improving the track reconstruction capabilities of the detector. This talk will give a general overview of ANNIE in general and the status of the LAPPD deployment.