T 35: Neutrino Astronomy II

Time: Tuesday 17:00–18:30 Location: POT/0051

T 35.1 Tue 17:00 POT/0051

Simulation of Bioluminescence for the Pacific Ocean Neutrino Experiment — •Moritz Brandenburg and Christian Haack for the P-ONE-Collaboration — Technical University Munich, Germany

The Pacific Ocean Neutrino Experiment (P-ONE) is a planned cubic kilometer-scale neutrino telescope in the Pacific Ocean. The first prototype detector line, P-ONE-1, is currently under construction. It consists of multi-PMT optical modules that will measure Cherenkov light produced by high-energy charged particles that stem from neutrino interactions in water. The optical modules are very sensitive to photons in the optical range, thus studying the impact of luminescent bio-organisms in the deep sea is crucial to forecasting expected trigger rates and the impact on neutrino searches. In this contribution we present a simulation that models the expected water currents around the optical modules which lead to stress-induced light emission of bioluminescent organisms. In the next step, the simulation propagates individual photons from expected emission positions to a simulated optical module. Analyzing the photon hits and PMT coincidences helps in designing the trigger algorithm that filters noise and reduces the background data rate.

T 35.2 Tue 17:15 POT/0051

Optical Timing and Synchronization for the Pacific Ocean Neutrino Experiment — •Lea Ginzkey, Christian Spannfellner, Michael Böhmer, and Elisa Resconi for the P-ONE-Collaboration — Technical University of Munich, Garching bei München, Germany

The Pacific Ocean Neutrino Experiment (P-ONE) aims to instrument more than one cubic kilometer of the Northeast Pacific Ocean off Vancouver Island (Canada) as a non-invasive next-generation neutrino telescope. P-ONE will measure high-energy astrophysical neutrinos and characterize the nature of astrophysical accelerators. A sub-ns timing synchronization within the photosensors in the detector volume is necessary to reconstruct the direction and energy of such highly energetic particles. Between the individual components of the P-ONE detector point-to-point fiber connections are used. A special implementation of ethernet allows to proliferate a central clock and synchronization signals to all modules in the system in real time, while offering a high bandwidth data connection by established protocols. This approach reduces the complexity of the system and cable design and optimizes the power consumption within the detector. First results of on- and offline delay measurements will be presented.

T 35.3 Tue 17:30 POT/0051

Neutrino detection with new triggers at the Pierre Auger Observatory* — Srijan Sehgal and •Michael Schimp for the Pierre Auger-Collaboration — Bergische Universität Wuppertal, Wuppertal, Germany

The Pierre Auger Observatory apart from detecting ultra-high energy comic rays is also an excellent instrument to look for highly inclined neutrino-induced air showers using its Surface Detector (SD) array. To improve the detection efficiency and to decrease the energy threshold of the array, two new SD triggers, time-over-threshold-deconvolved (ToTd) and multiplicity of positive steps (MoPS) were added in 2014.

This talk presents the work done to evaluate the effect of new triggers on the neutrino search. Events with energies below 10^{19} eV and in the zenith angle range of $60^\circ < \theta < 75^\circ$ are selected for both data and simulated neutrino-induced showers. The particular focus is on the improvements with the new triggers, MoPS and ToTd, to the neutrino sensitivity in comparison to previous neutrino searches at the Pierre Auger Observatory.

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T 35.4 Tue 17:45 POT/0051

Novel approaches in multimessenger observation of core-collapse supernovae — •David Maksimović and Michael Wurm — Johannes Gutenberg University, Mainz, Germany

In the case of a nearby galactic core collapse supernovae (CCSN), large-scale neutrino observatories and gravitational wave interferometers are expected to provide a wealth of experimental data.

This contribution presents a novel machine learning approach in the field of multi-messenger astronomy by investigating possible correlation between features in gravitational waves (GW) and neutrino signals originating from such galactic CCSN. Overarching phenomena during the explosion process can be so better understood, such as the suspected standing accretion shock instability (SASI) or oscillation modes of the newly formed proto-neutron star. Applying machine learning on combined GW- and neutrino-detector outputs from simulated CCSN can enable us a potential reconstruction of these crucial moments and parameters such as the shock radius during the explosion.

T 35.5 Tue 18:00 POT/0051

Event selection and spectrum unfolding for Supernova burst neutrinos in JUNO — •Thilo Birkenfeld, Achim Stahl, Jochen Steinmann, and Christopher Wiebusch — RWTH Aachen University

No core-collapse supernova (CC-SN) exploded close enough to be observed by terrestrial neutrino telescopes since the first detection of neutrinos from SN 1987A. The Jiangmen Underground Neutrino Observatory (JUNO) is a next-generation liquid scintillator detector with a large target mass of 20 kt. It will provide valuable insight into the details of the SN mechanism by observing the neutrino burst of a galactic CC-SN with high statistics and an unprecedented energy resolution of 3 % @ 1 MeV. JUNO will be sensitive to signals from all neutrino flavors via different detection channels. The reconstruction of their respective energy spectra requires an effective event classification. In this talk, we will present the results of an event classification and a subsequent Bayesian-based energy spectrum unfolding.

T 35.6 Tue 18:15 POT/0051

Hunting Supernova neutrinos with dark matter detectors — •Melih Kara — Karlsruhe Institute of Technology, Institute for Astroparticle Physics

During a massive star's death, 99% of its energy is released in the form of neutrinos. Neutrinos of all flavors escape the core well before any light. If detected, they can provide crucial information on stellar core collapse and its mechanisms. Detection of the next galactic supernova will provide the first multimessenger signal from electromagnetic waves, gravitational waves, and neutrinos. While existing neutrino observatories mostly probe neutrinos of a single flavor, ton-scale dark matter detectors can provide information from all flavors through coherent elastic neutrino-nucleus scattering, CEνNs, in the low-energy (few keV) range.

In this talk, we will discuss the challenges and opportunities of using two-phase xenon dark matter detectors for supernovae neutrino detection, and we will review some of the recent results and future prospects in this exciting field of research. I am also going to introduce the supernova early warning system, SNEWS, and the integration of the XENONnT experiment to SNEWS.