POPULAR DESCRIPTION OF THE PROJECT

Our knowledge about the World is still very limited, despite a long era of research in many fields. The theory of elementary constituents of the Universe - the Standard Model of elementary particles, despite its mathematical beauty and very precise description of a huge variety of phenomena, still fails to describe the mysteries of Dark Matter, Dark Energy and many others. Astrophysics keeps trying to examine the nature of the sources of very-high energy cosmic rays. Seeking answers to fundamental questions is possible in many ways: by observing the sky through more and more sophisticated telescopes, by performing experiments at particle accelerators, but also - by exploiting the gifts of Nature and instrumenting them with particle detectors.

Neutrino telescopes are experimental systems placed deep in transparent natural media in various geographical areas of the Earth. They are aimed at investigating a wide spectrum of scientific problems and primarily the natural neutrino fluxes. The deep underwater detection method provides a basis for experiments to record high- and possibly ultra-high-energy astrophysical neutrinos with neutrino telescopes. The detection principle is based on recording Cherenkov radiation from secondary muons or high-energy showers produced by the interaction of neutrinos with matter in transparent natural media.
The Pacific Ocean Neutrino Experiment (P-ONE) is currently under construction in the North-East Pacific, next to Canada shores. It is aimed primarily at studying astrophysical neutrino fluxes, will utilize the water of the Pacific Ocean, instrumented at depth with Optical Modules that detect the Cherenkov radiation from secondary particles produced in interactions of high-energy neutrinos inside or near the instrumented volume. The optical sensors will be organized in so-called clusters. By design, the P-ONE telescope is searching for neutrinos going upwards (traversing the Earth and interacting with the bedrock of the Ocean or its water) with energies between 100 TeV and 10 PeV.

The main goal of this project is to participate in the research conducted with the P-ONE Experiment. In particular, it will involve the work on the construction of a laser calibration system, and to design and construct a robust simulation framework for the experiment. Reliable simulations are needed to validate many experimental analyses conducted within the Collaboration. First analyses of the recorded data are also foreseen in this project.