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Simulation chain and signal classification for acoustic neutrino detection in sea water

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Acoustic neutrino detection is a promising approach to extend the energy range of neutrino telescopes to energies beyond 10^{18} eV. Current water-Cherenkov-neutrino-telescopes, like e.g. KM3NeT, include acoustical sensors in addition to the optical ones. While the main purpose of these acoustic sensors is the position calibration of the detection units, they could be used as instruments for acoustic detection, too. In this article a Monte Carlo simulation chain for acoustic detectors will be presented, covering the initial interaction of the neutrino up to the signal classification of recorded events. The ambient and transient background in the simulation were implemented according to the data recorded by the acoustic set-up AMADEUS in ANTARES. The effects of refraction on the neutrino signature in the detector are studied, and a classification of the recorded events is implemented. As bipolar waveforms similar to those of the expected neutrino signals are also emitted from other sound sources, additional features like the geometrical shape of the propagation have to be considered for the signal classification. This leads to a large improvement of the background suppression by almost two orders of magnitude, since the cylindrical "pancake" propagation pattern is a distinctive trait of neutrino signals. An overview of the simulation chain and the signal classification will be presented and preliminary studies of the performance of the classification will be discussed.

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