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Method for simulation of light propagation in water for large-scale underwater Cherenkov telescopes

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Large-scale neutrino telescopes, such as Baikal-GVD or ORCA, require calibration and testing of the optical modules. Calibration methods typically use laser and LED-based systems to not only test the telescope's response to light, but also to monitor optical parameters of water, such as absorption and scattering lengths, which show seasonal changes in natural water bodies. In addition, the high-energy laser is a strong light source that can cause damage to the optical modules under some conditions, hence the need to simulate the light distribution in the telescope volume as quickly as possible, taking into account the varying conditions of the medium and the configuration of the telescope components. In this work we show an efficient/fast tool for the simulation of laser light propagation in the active volume of neutrino telescope. Fast simulations may be used to choose the correct and safe parameters of the light source, like energy, intensity, direction, thus can improve the calibration procedure. The cross-check of our simulation results, such as arrival time and expected signal recorded by the optical modules with Geant4 simulations has been also presented.

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