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Results of testing the optical module for the Cherenkov water detector

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In recent years, many scientific groups working with Cherenkov water neutrino telescopes (IceCube, KM3NeT) began the development of new generation of optical modules (OM). As a rule, these are modules based on a large number of PMTs in quasispherical configuration which allows getting the response practically independent on Cherenkov light direction. In this regard, it becomes necessary to develop new methods for testing of optical modules in an environment as close as possible to the working conditions inside the neutrino telescopes. For the calibration of OMs, usually LED or laser sources with fixed wavelengths are used. They cannot imitate the continuous spectrum and the directionality of the Cherenkov radiation sufficiently well. Therefore the calibration of these OMs in a Cherenkov water detector is advantageous. NEVOD is presently worldwide the only setup which meets these requirements. The possibility to calibrate new optical modules mDOM of the IceCube-Upgrade neutrino telescope inside the tank of the Cherenkov water detector NEVOD is discussed. Methods to calibrate optical modules are presented. Methods have been tested with quasispherical optical module QSM-6, in which FEU-200 PMTs were replaced by Hamamatsu R877 photomultipliers. The spatial lattice of the NEVOD detector and calibration telescope system and coordinate-tracking detector DECOR deployed outside of the water tank allow calibrating the response of OM to the Cherenkov light from muons, muon bundles and cascades with known trajectories.

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