

Results and simulation of the prototype detection unit of KM3NeT-ARCA

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KM3NeT-ARCA is the successor of the ANTARES Mediterranean neutrino telescope. It is a km³ detector using a new design for the light detection units: the digital optical module. These optical modules were developed by the KM3NeT Collaboration to improve the detection capability of neutrino interactions in the fiducial volume thanks to their large total photocathode area, summed on the 31 three inch photomultiplier tubes used in each optical module. Prototypes of these detection modules has been installed in the deep sea sites of the future full detector. The directionality and the number of hit PMTs allow the identification of the Cherenkov light from natural 40K decay and of the atmospheric muons, with a sensitivity to its arrival directions. It can also identify the bioluminescence activity in the neighborhood. These results show good agreement with the Monte Carlo simulations and will be presented together with the description of the very last status of the full ray tracing simulation.

The purpose of this simulation is to give a high precision simulated response of the digital optical module. It is based on GEANT4 and takes into account all the parameters such as the medium characteristics, the geometry and material characteristics of the modules. Its major innovation lies in the simulation of the thin layer optics of the photo-multiplier tubes (PMTs). As a result, this simulation provide very precise understanding of the optical module sensitivity in function of photon directionality and wavelength, therefore a better understanding of its response to the signal and background.

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