

## **Cherenkov water detector of the TAIGA-100 observatory**

TAIGA (Tunka Advanced Instrument for Cosmic Rays and Gamma-Astronomy) is the largest gamma-ray observatory in Russia, designed for detection of the high-energy gammas in the range from several TeV to several PeV, as well as of the high-energy cosmic rays (CR) in range from 102 TeV to 103 PeV. A new EAS complex TAIGA-100 is based on the experience of the TAIGA observatory and is planned to be deployed in the next 10-15 years. The complex will include an array of approximately 3000 Cherenkov water detectors at the area of 100 km<sup>2</sup>. The experimental setup will allow detection of muons from extensive air showers and effective separation of gamma- and hadron-initiated air-showers.

The Cherenkov water detector (CWD) of TAIGA-100 represents a cylindrical concrete tank, filled with purified water, with wall thickness of 10 cm and inner dimensions of 360 cm x 120 cm. The tank is buried in soil and has a soil overburden with a thickness of 250 cm. The inner surface of the tank is covered with diffuse reflective liner with reflection index of 0.98. The tank includes one Hamamatsu R7081 PMT mounted in the center of the upper face.

To study the characteristics and to determine the optimal design of the CWD for the TAIGA-100 observatory, its simulation using the Geant4 software package was performed. In the report, the detector design and the properties of used material and optical surfaces are described. The results of calculating Cherenkov photons lifetime in the CWD are presented. The results of simulation of the PMT responses to muons passing through the detector in different directions and of the influence of soil overburden thickness on the detector response to muons, gammas and hadrons are discussed.

**Primary authors:** GUDELEV, Max (NRNU MEPhI); YASHIN, Igor (National Research Nuclear University MEPhI); BOGDANOV, Aleksei (MEPhI); DMITRIEVA, Anna (National Research Nuclear University MEPhI (Moscow Engineering Physics Institute))

**Presenter:** GUDELEV, Max (NRNU MEPhI)

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