量子物理学・ナノサイエンス第 405 回セミナー

Water Cherenkov Test Experiment (WCTE) at CERN and its spin-off drinking water monitoring project

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概　要

A new beam test experiment of a 4m diameter water Cherenkov detector is underway. The detector is a half-scale in-length prototype of the HyperK Intermediate Water Cherenkov Detector (IWCD). This experiment also provides unique control samples for the SuperK and HyperK experiments, such as demonstrating a factor of 1000 suppression in e/μ particle identification, pion responses in the water Cherenkov detectors, and the e/γ separation in the water Cherenkov detector. A new particle identification system to cleanly separate sub-GeV pions from muons has been successfully developed. We also aim to measure the muon quasi-elastic scattering to constrain the neutrino interaction models, precise relative Cherenkov light yield ratio between electrons and muons for the energy scale calibration for the neutrino mass ordering determination, and production cross-section of 9Li by pions to constrain the diffused (relic) supernova study by SuperK. The later part of the talk will be devoted to a new water quality monitoring system developed for WCTE, which will be applied to online drinking water monitoring. The sensitivity of this system is three orders of magnitude better than the standard spectro-photometer, reaching the drinking water limit for the cyanotoxins from water source lakes and organic mercury from the melting permafrost, which have become serious problems due to global warming.

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