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TITUS: An Intermediate Distance Detector for the Tokai-to-Hyper-Kamiokande Neutrino Beam and Physics with Gadolinium

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The Tokai Intermediate Tank for Unoscillated Spectrum (TITUS) detector is a proposed addition to the Hyper-Kamiokande (Hyper-K) experiment, located approximately 2 km from the J-PARC neutrino beam. The design consists of a 2 kton Gd-doped water Cherenkov tank, partially covered by a magnetised muon range detector. The target material and location were chosen so that the neutrino interactions and beam spectrum at TITUS would match those of Hyper-K. Including a 0.1% Gd concentration allows for $\nu/\bar{\nu}$ discrimination via neutron tagging. The primary goal of TITUS is to measure the neutrino spectrum at the near detector with a very high precision, thus improving the Hyper-Kamiokande CP violation sensitivity. TITUS is also able to precisely measure cross section as a function of the neutron multiplicity and can be used for physics unrelated to the J-PARC beam, functioning as an independent detector for supernova neutrino bursts and measuring the neutron rate to improve Hyper-K proton decay searches.

Also, a more general overview on the physics with gadolinium both for high and low energy physics and synergy with other worldwide programmes will be given.

Collaboration

The TITUS working group

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